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Address.

HISTORY OF MILITARY MEDICINE AND ITS CONTRIBUTIONS TO SCIENCE.

BY MAJOR CHAMBERLAIN, U.S.A.

I.

THE use of arms, however primitive, for offense or defense, must be almost coeval with the appearance of man upon this planet. The carvings of prehistoric races depict the march of organized armies, and from the deepest shadows of history echoes faintly the clash of contending nations. In ancient times the art of war, like other fields of human endeavor, was simple in its practice, victory depending largely upon numbers and brute strength, though the successes of the great commanders of the past, such as Alexander, Pyrrhus, Hannibal and Caesar, were due in part to superior equipment, and in part to a better grasp by them of the principles of military tactics and strategy. With the increasing complexity of civilization the art of war has not been left behind. Its demands along the lines of equipment, personnel and brains have steadily increased, and today more than ever before, we find in Europe that the latest discoveries in every branch of science, the co-ordinated energies of the entire nation, and the keenest of intellects are requisitioned to add to the death-dealing powers of the contending races.

While war dissipates treasure, and sacrifices human life by reason of disease and injury, it is the duty of the medical officer to prevent needless wastage of life and limb, first in order to promote military efficiency and secondly in the interest of humanity. *And let it be emphasized at the outset that today the first duty of military medicine is not humanitarianism.* War in its essence is both cruel and wasteful, putting the good of the whole above that of the individual, and the military medical service aims primarily to prevent *unnecessary* waste and to remove from the front the inefficient, in order that the supreme commander may have the largest possible number of unhampered fighting men on the firing line. If there is a clash between the welfare of the wounded and the movements necessary for the most efficient prosecution of the conflict, then humanitarianism must give way to military necessity, since victory is the paramount consideration and ultimate success the only complete justification of war. Consideration for the wounded must not be allowed to interfere with the interests of the army as a whole, and it has been said that the commander takes best care of his wounded by annihilating the enemy as promptly as possible.

Like his combatant comrade the military medical officer must bring to his aid, both in peace and in war, every resource known to the healing art. In no other field of professional life is the physician expected to be thoroughly familiar with so many diverse branches of knowledge.

The development of military medicine and surgery began at the same time, and kept pace with the slow growth of those arts in civil life.

Egyptians, Babylonians and Hebrews had physicians with their armies, and Sanskrit accounts inform us that thousands of years ago the wounded were removed from the field of battle, and taken care of in tents where beds of leaves were prepared for them. For many ages priests assumed the rôle of physicians in both military and civil practice. Homer tells us that several of the great commanders were skilled in the treatment of wounds, and that a fleet of thirty ships was set aside for the care and transportation of the wounded,—the first record of ships being used for that purpose. That the work of the surgeon was appreciated in the time of Homer is shown by the words he put into the mouth of Nestor:

"A surgeon skilled our wounds to heal
Is more than armies to the public weal."

Homer also lauded the two sons of Aesculapius, both for their skill in arms and for their wisdom in surgery, and thus wrote of them 1200 years before the birth of Christ:

"Of two great surgeons, Podalirius stands
This hour surrounded by the Trojan bands,
And great Machaon, wounded, in his tent
Now wants the succor which so oft he lent."

Again he describes an operation performed by one of the surgeons as follows:

"Patroclus cut the forky steel away;
While in his hand a bitter root he pressed,
The wound he washed and styptic juice infused;
The closing flesh that instant ceased to glow,
The wound to torture, and the blood to flow."

As an example of the practice of a later Greek period, it is stated that Xenophon had eight field surgeons with his 10,000 troops.

During the Roman republic officers of wealth and prominence had their own private surgeons who accompanied them on the march, but there were no special surgeons for the armies. A regular military medical service dates from the time of the Emperor Augustus. At one period we are told that each cohort of 420 men had four surgeons, while each legion of ten cohorts had a legionary physician. In the navy there was one physician to each trireme. The physicians were Romans, or naturalized foreigners, and received special instruction for their vocations. At this date hospitals (*valetudinaria*) were established for the severely wounded who were cared for by male attendants. Physicians to Roman legions were of two grades, but commanded little respect and their standing was on a par with that of the non-commissioned officers. Under the influence of Christianity it became possible to secure more capable surgeons. and non-combatant hospital corps men and litter bearers came into use. Their duty was to remove the seriously wounded to a place of safety, and to care for them, receiving a reward in silver for each man saved. They were required to carry a supply of drinking water and to furnish it as long as the wounded suffered from burning thirst. Each army had a common hospital. The physicians had no executive power and were subordinate to non-commissioned officers.

Abul Kasem, an Arabian surgeon of note living in the latter part of the tenth century, in his work on medicine devoted to the practice of military surgery a chapter which embodied his own experience on the battlefield. The Helvetians regarded the treatment of the wounded as a sacred duty, but limited its application to their own soldiers, all wounded of the enemy being invariably killed. This practice was sanctioned by many other nations.

After the decline of Rome, armies seem to have been without organized surgical assistance for many centuries. Wounded were removed and cared for by their comrades and by female camp followers. Up to the 13th century the practice of medicine was largely carried out by monks, and when this was prohibited by Papal decree, it fell into the hands of the barber-surgeons, who for many years were the only representatives of a sanitary service with combatant units. The names of two military surgeons, Manniot and Nigellus, are recorded in Doomesday Book, 20 years after the battle of Hastings. In 1300 it appears that an effort was made to establish a medical corps in the English army, but in the muster roll of 1346 no sanitary personnel is mentioned. In 1415 at the battle of Agincourt there were with King Henry V a physician, a surgeon and 12 assistants. Physicians, however, were for the nobles, not for the common soldiers. Charles the Bold of Burgundy in the 15th century is said to have been the first to attach surgeons to troops instead of to officers. Gustavus Adolphus did the same in 1630.

As the healing art slowly developed, a few better educated men came to occupy the higher medico-military positions, but in general there was no organized medical service in armies till about the 16th century, and even then conditions were most primitive. Most of the common soldiers with serious wounds were left to die where they fell. If ill or permanently disabled, they were dismissed with a little money to enable them to reach their homes. As illustrative of the practices of the times it is related that Ambroise Paré, the foremost military surgeon of the period about 1550, saw three desperately wounded soldiers placed with their backs against a wall. An old campaigner inquired, "Can those men get well?" to which Paré replied "no." Thereupon the old soldier went over to them and cut all their throats, as the chronicle puts it, "sweetly and without malice." When Paré upbraided him the old campaigner said he prayed God, if he were in similar plight, that some one would do the same for him, that he might not linger in his misery.

The ancient treatment of military wounds was most primitive. For many ages injuries inflicted by swords, lances, arrows, and mace chiefly claimed attention. Arrow wounds were often regarded as poisoned, so treatment by boiling oil was considered by many as most appropriate, and may have had some favorable influence by combating infection. Oil and wine were a favorite remedy for wounds. Arrowheads lodged in the body were drawn out with various crude instruments. Often they were pushed through and removed by incision from the opposite side. In other instances, where less accessible, they were treated by drawing plasters. Rabbits' hair, mill dust, and moss from skulls found in graveyards were used as styptics. Two of the greatest teachers warned surgeons not to undertake an operation, if the life of the patient was in jeopardy, until he had received the last sacrament,—a very cheering pre-operative procedure. As most of the ancient surgery was practiced by men without education, the literature on the subject is very scanty and unreliable. Clumsy instruments for extraction of arrows were used for centuries without improvement, and ignorance and superstition clogged the wheels of progress.

The introduction of gunpowder, beginning in the middle of the 13th century, gradually effected a complete revolution in military strategy and opened up new fields for the military surgeon. The replacing of long-bows and cross-bows by firearms progressed very slowly, and improvement in the efficiency of these weapons was equally backward. In the unsatisfactory state of surgery in the mediaeval period, the introduction of firearms brought new dangers and increased the sufferings of the wounded. Fractures of the long bones, previously rare in warfare, became common, together with extensive lacerations of the soft parts. Probes and fenestrated bullet forceps were gradually introduced. In the 15th, 16th and 17th centuries the writings show that some still considered such wounds poisoned and treated them by boiling oil, multiple scarification and venesection; while others, especially German surgeons, objected to these cruel methods and resorted to mild measures, such as warm oil of turpentine, hempseed oil, honey and warm milk, especially goat's milk. Tents rubbed with pork to keep the wounds open were advocated. Alum, white hair of the rabbit, droppings of peacocks, dried blood, burning cotton and red-hot irons were relied on as hemostatics. Suppuration was considered a necessary preliminary to healing. Amid the barbaric methods, the charlatanism and the superstition of the 15th and 16th centuries, a few brilliant lights flickered, notably Wurz, a famous Swiss barber-surgeon (1518-1575), Mithobius who wrote a treatise on military surgery in 1553, and Gelman who published works on the same subject in 1652. Gelman described a death from tetanus, following a gunshot wound, which he blames on the surgeon, saying that the patient could have been saved if he had been given a draft of Thiriak Andromach in wine of lily of the valley, and if the neck had been rubbed with a particular ointment, and the mouth held open with a gag. The greatest advance in surgery of this period was made by Ambroise Paré (1510-1590), to whom belongs the credit of having brought about the introduction of the ligature, though he himself was not the first to use it. Purman, who wrote an excellent book on military surgery in 1738, is the first to describe deformation of bullets.

In the earliest recorded sanitary organization with armies the barber-surgeons were attached to companies, and a staff physician was assigned to the headquarters of each large force. Regimental surgeons were appointed in the English service as early as 1639 and ranked with chaplains. Sick and wounded were treated in their company camps by camp followers, and when the army moved were carried on wagons or left at the nearest town. In some cases the barber-surgeons provided their own medicines and instruments, while in other instances deductions were made from the men's pay for the purchase of such articles. About the year 1700 medicine chests were provided as a part of the equipment of regiments. In the early part of the 18th century the training of a better class of military surgeons was begun and these men were placed in the position of regimental surgeons, supervising the company barber-surgeons. England was one of the first countries to recognize the necessity of a regular medical service in the army and to respect medical officers. From very remote times the medical department was an integral part of the English army, and in 1685 mention is made of a surgeon general, and under William III there was a physician general, Sir Patrick Dun. In 1751, for the first time English surgeons were permitted to wear the uniform of the troops to which they were attached, and in 1783 a law was passed prohibiting the sale of the position of surgeon, but this abuse nevertheless continued for a long time. A real medical service in France dates from 1708.

In the 17th century military hospitals began to be established in garrisoned towns and in the rear of armies, and to these as bases the wounded were removed. Partly mobile hospitals came into restricted use about 1700, but were not adapted for accompanying marching troops. For many years these hospitals usually carried no tentage and did not reach the field till a day or two after the battle. By a treaty between England and France these hospitals were declared neutral and were treated as such. The Napoleonic wars brought out the amplification of sanitary resources by the use of combatant soldiers detailed as litter-bearers and surgeons' helpers. About this same time the barber-surgeons were being generally replaced by trained surgeons, several of whom were attached to a regiment, while medical staff officers were being placed in charge of the sanitary work with armies to coördinate their sanitary resources. Only in 1779 had the barber-surgeons in the British army been given the grade of sergeant, and even then each of them had to expect a whipping if one of his grenadier patients died under his care. Ambulance wagons to transport wounded gradually appeared as a part of the equipment of regiments. About 1810 so-called flying hospitals, able to follow troops, began to be roughly organized. A further great improvement in the type of medical men with the colors occurred, with corresponding improvement in their status. In 1815 Dr. Jackson, who was appointed by the Duke of York, Physician of all the Forces, demanded military honors and decorations for his officers. He said that such titles were irrelevant to scientific men, but that the common soldier would obey the medical officer better if he possessed rank in the army. Jackson's view is as true today as in the past, and forms the basis of the present grading and organization of medical departments in all armies. However, in the English service up to 1871, medical officers absolutely belonged to regiments, were exclusively under the control of their commanding officers, and had no powers of command. As a result of our Civil War and the Franco-German conflict in 1870, the importance of increased mobility for sanitary troops was recognized in the British service, the regimental system was broken up, and gradually a medical staff with mixed medico-military titles developed; but its officers were still denied many of the powers which pertained to similar grades in the line. Only in 1898, when the designation was changed to the Royal Army Medical Corps, were British medical officers granted full military titles and most of the accompanying powers which correspond with like grades in combatant branches of the service.

Light field hospitals, able to accompany troops with supplies, surgeons, apothecaries and assistants, came into being about 1850, but these had no organization of litter-bearers to bring wounded to them and depended on requisitioned country carts for transport of disabled. The Crimean War demonstrated the inefficiency of the British medical department and emphasized the necessity for some mobile transport organization. As a result litter-bearer sections were organized in several armies. Prior to this the fate of the wounded had been pitiable, though the short range of weapons and close order of battle formation had been factors which greatly facilitated collection and succor of the injured.

Improvements in firearms and munitions, especially rifling and the use of fixed ammunition with conoidal bullets and percussion caps, had caused, at the time of our Civil War, a great increase in the range and rapidity of fire. Tactics began to adjust themselves accordingly. Danger zones increased in depth and the rapidity and precision of the new arms brought about thinning and lengthening of the lines. As a result the wounded were scattered over a much larger area than before. Our sanitary service at that time consisted of several surgeons and a small hospital for each regiment, a fairly mobile field hospital under canvas for each division, a division surgeon to administer the foregoing, and at the bases a great number of vast fixed hospitals. This system was cumbersome and impracticable in that it retained with the regiments seriously disabled men and bulky supplies, neither of which had a place there. It was therefore destructive to tactical efficiency by interfering with the mobility of fighting units. It was undesirable from a humanitarian standpoint because it held sick and wounded at the front where their care and comfort could not be properly considered. The sanitary equipment of the regiments was usually far back with the trains and not available when most needed. The personnel of one regiment might be overwhelmed with wounded while that of another, not engaged, was entirely unoccupied. There were no reserve sanitary organizations for bridging the gap, often very great, which intervened between the firing line and the division hospital, and between the latter and the advance base, or for reinforcing the sanitary services attached to commands which were overwhelmed by a high proportion of casualties. As a result great delays in succoring the wounded, and unimaginable suffering, occurred in the early part of the Civil War. That these undesirable conditions were not confined to our own army is shown by the words of an experienced French military surgeon, Le Gouest, who wrote about this time as follows: "Military surgeons who have been present in various engagements all know that when the wounded fall in ranks there are none to carry them off except their own comrades;.......... the soldier quits the ranks often never to return or only after the fight is over; the number of men carrying off their comrades is rarely limited to the number really necessary, and one may sometimes see four or five or even six soldiers conducting to the hospital a man slightly wounded and marching quite as well as his comrades." It is easily understood how serious to the plans of the commander were such depletions of the ranks in the alleged interest of humanity, but often with the real object of escaping danger. So crippling was the disability under which the sanitary service labored that on August 21, 1862, and again on September 7, 1862, Surgeon General Hammond submitted plans for an independent sanitary organization for use with mobile troops. In both instances these recommendations were disapproved by the War Department. In the Army of the Potomac, however, Medical Director Letterman had convinced General McClellan of the need for special aid for the wounded, and on August 2, 1862, he issued an order embodying Letterman's views. His plan, in brief, called for independent ambulance corps for each army corps. This corps was equipped with ambulances and litters, a medicine wagon, and a mounted personnel of officers and sergeants. The transportation was to be used for the carrying of sick and wounded *and for no other purpose. No persons except those duly authorized were permitted to accompany sick and wounded to the rear,* either on the march or in battle. Subsequently Letterman added plans coördinating the work of the ambulance corps and the field hospital. The advantages of this system promptly became manifest, and it gave admirable service at the battle of Antietam in the month following its inception. Later Grant adopted the essentials of Letterman's plan in the army of Tennessee, and finally, though very tardily, Congress passed an act, approved by the President on March 11, 1864, establishing a uniform system of ambulance service throughout the military forces. The value of this mobile independent sanitary organization in saving life and suffering, and in promoting tactical efficiency, cannot be overestimated. The organization and plan worked out by Letterman was so complete and practicable that it remains today the foundation upon which the mobile sanitary service in all armies is largely built, though experience has taught that its personnel should be composed exclusively of officers and men belonging to the Medical Department. With the development of field hospitals and ambulance companies, both being large, independent sanitary organizations, the need of military rank, with authority to command, for medical officers has become more evident, and the subject of sanitary tactics, as an important branch of the art of war, has become an established fact, recognized in all armies.

As the organization needful for the handling of the disabled gradually emerged from the neglect and chaos of the middle ages, so also the practice of military surgery improved coincidently with the progress of surgery in civil life. Intimately associated with the earlier achievements are the names of Paré, John Hunter and Larrey. The suffering inherent in war was enormously alleviated by the discovery of anaesthesia. Still the specter of infection remained, and hospital gangrene was the scourge of the wounded in the Civil War. With the development of antisepsis and asepsis a new era dawned for the military as well as for the civil surgeon. At a somewhat later date the introduction of small caliber, steel-jacketed bullets, which usually produced a small, relatively sterile wound, together with the use of sterile first-aid packets, led to a vast number of healings by first intention in the case of gunshot injuries which had been merely dressed aseptically and then left alone. Asepis and conservatism were the watchwords, and the saying passed current that the fate of "the wounded man rests with him who applies the first dressing." Much of this optimism has disappeared in the last two years, as a result of the vast European War. The bullet of the latest military rifle is not as humane as that used a dozen years ago. Shrapnel, high explosive shells, hand grenades and bayonets, produce a proportion of wounds far in excess of anything dreamed of in the past. The conditions of trench warfare favor infection, and the great range of modern weapons, and the vast numbers of wounded, have rendered collection of the injured and removal to a place of final treatment far more slow and difficult than ever before. The character of the wounds produced by shell, shrapnel, hand grenades, and spitz bullets is such that the first-aid dressing has failed to confer as high a degree of protection as it afforded in the wars of the previous two decades. Asepsis is less in vogue, and in England the cry has been raised, "Back to Lister,"—in other words, antisepsis with strong disinfectants like pure phenol. Extensive opening of wounds with free drainage has replaced expectant and conservative treatment. No longer is it said that the fate of the wounded rests with him who applies the first dressing, but rather that his future depends upon the rapidity of transportation and the possibility of thoroughly treating his wounds as soon as possible by elaborate surgical procedures.

II.

Turning from the field of surgery, and relief organization in battle, we find that military medicine, as distinguished from surgery, is intimately associated with, and a decided contribution to, the subject of preventive medicine. Since the days when "The Assyrian came down like a wolf on the fold," armies have been peculiarly the victims of epidemic diseases. Numberless campaigns have failed in whole or in part, because of dysentery, cholera, plague, scurvy, measles, smallpox, yellow fever, malaria, typhus or typhoid. An interesting review might be written dealing with history as influenced by epidemic disease. Up to the time of the Franco-Prussian War in 1870, disease had always claimed far more victims in every campaign than had the bullets of the enemy. With the growth of the knowledge of infections during the last half-century, the control of diseases due to preventable causes has become one of the paramount duties of the military surgeon, and the success he has attained is shown in the remarkably great decrease of sickness in the Russo-Japanese war, and in the present war in Europe, as compared with campaigns of the past. In our own service three great triumphs stand forth,—the eradication of yellow fever in Cuba, the prevention of beri-beri among Philippine troops, and the suppression of typhoid fever through our entire army by anti-typhoid inoculation.

Looking back a little more than a century and a half the eye is caught by the name of Sir John Pringle (1707-1787), who is called the founder of modern military medicine as contrasted with surgical practice. Pringle, a Scotsman, served on the continent in the mid-century wars and was surgeon general of the English army from 1742 to 1758. His work "Observations on Diseases of the Army," 1752, promulgates the true principles of military sanitation, especially in regard to the ventilation of hospitals, ships, jails and barracks. He gave a good description of typhus fever, showed that jail fever and hospital fever were the same, correlated the different forms of dysentery, and named influenza. About six years later appeared Van Swieten's monograph on camp diseases, and two works on the hygiene and diseases of sailors by James Lind and Thomas Trotter. Both of these physicians published monographs on the subject of scurvy, which came into great prominence through its ravages among the sailors of Lord Anson's expedition in 1740.

No review of the history of military medicine would be complete without the mention of some of those military medical men whose names should always be held in memory because of notable services to the cause of progress and humanity. The civilian is apt to think that the duties of the medical officer are light and routine, and that his professional work consists largely in treating venereal diseases. Far otherwise. His life is a busy one, entering into practically every field of medicine, in many of which he delves so deeply that he unearths nuggets for the use of future generations. The first name I will mention is that of Ambroise Paré, born in 1510, the great French military surgeon whose fame particularly rests on the substitution of the ligature for the actual cautery and the styptic relied upon before his time for the control of hemorrhage. He was not the first to use the ligature, but to him belongs the credit of having led to its general introduction against great opposition. He combated the prevailing opinion that gunshot wounds were poisoned. He opposed the use of boiling oil, popularized the use of the truss, introduced massage, artificial eyes and staphyloplasty. He described fracture of the neck of the femur, and was the first to suggest syphilis as a cause of aneurysm—a goodly contribution for one who began his career as an apprentice to a rustic barber. His first military patient was a captain shot in the ankle. Paré says of this case, "I dressed him and God healed him." As he passed through campaign after campaign, his reputation became more firmly established among both soldiers and physicians. When he entered Metz, which was being besieged by Charles V in 1552, and was dramatically presented to the officers by the Duke of Guise, he was received by the soldiers with shouts of triumph and the exclamation, "We shall not die even though wounded, for Paré is among us."

John Hunter, the erudite scholar and great surgeon, was a staff surgeon in 1761, when he gained his unique knowledge of gunshot wounds. His contributions to surgery are too well known to need mention. He was made deputy surgeon general in the British army and introduced a system of promotion in the medical service.

The name of Baron Larrey is ever associated with the campaigns of Napoleon, and he was one of the great Emperor's intimate friends and most trusted advisors. His energy on the battlefield and his genius for organization have never been surpassed. His flying ambulance corps and mounted surgeons often passed through showers of bullets in bringing aid to the wounded. At Aboukir Bay he amputated General Sully's leg above the knee under fire, and carried this officer to safety on his own back just in advance of a charge of British cavalry. He was an able surgeon and the first, in spite of strong opposition by civil surgeons, to advocate the employment of plaster splints in the treatment of gunshot fractures. In fractures of the leg, he used them to allow the patient to leave his bed as soon as possible. His military service extended over 50 years, and he participated in 26 military expeditions in three continents. Probably under no circumstances did the ability and courage of this remarkable man show to better advantage than during Napoleon's retreat from Moscow. After the battle of Borodino, Larrey made 200 amputations, practically with his own hands, with no bed or shelter, cold so intense that the instrument often fell from the benumbed fingers, and with the Cossacks hovering around equally ready to kill patient and surgeon. At the battle of Waterloo, he was sabred by Prussians and left for dead. Recovering consciousness and trying to make his way across France he was captured, robbed and sentenced to be shot. A Prussian surgeon, who had attended Larrey's lectures several years before, recognized him, and the order of execution was stayed by Marshal Blücher, whose son had been saved through Larrey's exertions when wounded by the French in the Austrian campaign.

The greatest of Russian surgeons, and one of the greatest military surgeons of all times, was Nikolas Ivanovich Pirogoff, born in 1810, and who, like Paré and Hunter, had a remarkable career of self development. He served in the Caucasus in 1849, in the Crimea in 1854, and also reported on the Franco-Prussian and Turco-Russian campaigns. He defined war as a "traumatic epidemic." He introduced female nursing of the wounded in the Crimea and was a warm advocate of freedom and higher education for women. In his treatise on military surgery, published in 1864, he holds large hospitals responsible for the spread of epidemic disease, and recommends small pavilions and segregation. His method of complete osteoplastic amputation of the foot is well known to all surgeons.

Friedrich von Esmarch, the great German military surgeon, introduced the first aid dressing and standardized surgical hemostasis by the Esmarch bandage. He did much to improve the status of military surgery, and the first aid treatment of wounds. By marrying a royal princess he became uncle to the present Kaiser. Turning from the realm of the wounded we find that Emil von Behring, whose name is ever associated with antitoxin, began his career as a Prussian army surgeon. In 1880 the epoch-making discovery of the malarial plasmodium was made by Alphonse Laveran, a French army surgeon. The importance of the discovery of plasmodium was equalled by the demonstration of mosquito transmission made by Ronald Ross, a surgeon in the Indian Army Medical Service. After years of patient work he was able to trace the full development of an avian parasite in culex and partly that of the human malarial parasite in anopheles. Zieman, a naval surgeon, was the first to confirm the work of Ross and the Italian observers. More recently much important and original work on malaria, as well as on entamoeba, has been done by Captain Charles F. Craig of our own medical corps, who has written several monographs on these subjects. Captain Craig, in association with Major Percy M. Ashburn, was the first to establish the truth of Graham's theory that dengue fever is transmitted by the bite of mosquitoes of the genus culex.

Our knowledge of tropical medicine was enormously advanced by Col. Sir W. P. Leishman and by Major Charles Donovan, both of the British service, who independently discovered that the so-called Dum-Dum fever, or Kala-Azar, was due to an intracellular parasite, which has been named, in honor of its discoverers, Leishmania donovani. The name Colonel Leishman is also associated with one of our well known polychrome stains.

Other names intimately associated with tropical and preventive medicine are those of the naval surgeons Mormand and Bovay, who first described the parasite of Cochin-China diarrhoea; Major Bailey K. Ashford of our army, whose work on hook worms in Porto Rico is too well known to need description; Captain E. D. Vedder who in my laboratory in Manila performed the experiments with emetin and amoeba, which led Leonard Rogers to undertake the hypodermic treatment of amoebiasis with that drug. Captain Vedder and myself in Manila carried out extensive investigations on beri-beri, and were the first to show that the extremely fatal infantile beri-beri was promptly curable by the use of an extract of rice bran or polishings. While the English and the Germans were the pioneers in developing the anti-typhoid inoculation, it was through the enthusiasm and energy of Major F. F. Russell of our medical corps that the practice was introduced and made compulsory in the United States Army. Our service was the first in which *compulsory* anti-typhoid vaccination was employed, and the demonstration that the scourge of armies could be eradicated, as a result of this measure, stands as one of the greatest triumphs of preventive medicine.

Among others in our own service whose names will be remembered, should be mentioned General George M. Sternberg, formerly surgeon general of the army, and who has but recently died. Sternberg was a pioneer in bacteriology in this country and his book on that subject was for many years a standard work of reference. He was particularly interested in the subject of yellow fever and it was due to this interest, that the board of army medical officers was appointed which disclosed the method of transmission of that disease.

Among those members of our Army Medical service who subsequently became prominent because of work outside the practice of medicine and surgery may be mentioned Major-General F. C. Ainsworth, who was for many years adjutant general of the army, and Major-General Leonard Wood, a graduate of Harvard, who for high executive ability has been promoted to many important posts. Colonel John Shaw Billings has been pronounced by competent authority to be the most eminent bibliographer in the history of medicine. He served with great credit as surgeon through the Civil War, and in 1864 was transferred to Washington for duty, where he remained till his retirement in 1895. His name is indelibly associated with the upbuilding of the Library of the Surgeon General of the Army, which through his energy became the largest medical library in the world, and also with his index catalogue of this library. With Fletcher he edited the Index Medicus for 20 years. The trustees of the Johns Hopkins Fund in 1876 elected him as their medical advisor after having accepted his designs for the Johns Hopkins hospital as the most satisfactory of any submitted. In 1896, one year after his retirement from active service, he became superintendent in chief of the New York Public Library, where he solved the enormous difficulties connected with the consolidation of the New York libraries and the construction of the present magnificent building. He remained with the library until his death in 1913. In 1905 he was selected to lay out the plans for the Peter Bent Brigham Hospital now facing the Harvard Medical School.

The name of Jonathan Letterman should always be remembered by military surgeons as the greatest sanitary organizer of modern times

I have already referred to his plans for an ambulance corps which became the basis for such service in all armies. He put an end to the depleting of the ranks of the army which had been caused by injudicious and careless discharges for disability, and by the license of sending to distant general hospitals men who should never have left the zone of operations. He insisted on having sick and wounded treated at hospitals nearer the front whenever the condition of the service and the welfare of the patient permitted, thus doing away with one of the chief factors in military absenteeism. By well-thought-out sanitation, strenuously enforced, he kept the Army of the Potomac in a state of health unparalleled in forces of such magnitude at that time. For alleviating the sufferings and saving the lives of thousands of his countrymen, and for adding to the vigor, discipline and effective fighting strength of the principal army of the Republic, he has a just claim to the grateful remembrance of his professional brethren, of his comrades in arms, and of his countrymen. General McClellan wrote of him in 1863, "I never met with his superior in power of organization and executive ability." His name is now commemorated in the Letterman General Hospital at the Presidio of San Francisco.

The most distinguished and important internist of the early French school was René Laennec (1781-1826). Like Bichat, the creator of descriptive anatomy, he was a regimental surgeon in the French Revolution. Both were early victims of phthisis. If we can trust Kipling's description it was while a military prisoner in England that Laennec carried out the experiments with the stethescope, the instrument with which his name is indissolubly connected.

Intimately associated with the Post of Plattsburg Barracks from which I have recently come, is the name of an army medical officer at whose door opportunity knocked and was not refused entrance. Dr. William Beaumont, by his observations and experiments on the Canadian halfbreed, Alexis St. Martin, laid the foundation for our present knowledge of gastric digestion. Part of this work was carried out at the isolated military post of Mackinaw in the primeval forests of Michigan about 1825, and the remainder of the investigations were conducted at Plattsburg Barracks, N. Y. Beaumont was the true leader and pioneer of experimental physiology in our country. His work remains a model of patient, persevering investigation, experiment and research.

The conquest of yellow fever is a far-reaching achievement to which America can lay entire claim and which especially reflects credit upon the Medical Corps of the United States Army. In 1900 the army board, consisting of Major Walter Reed, Major James Carroll and Contract Surgeons Lazear and Agramonte, proved by a series of brilliant and conclusive experiments that yellow fever is transmitted by the bite of a mosquito, the Stegomyia fasciata. Basing his sanitary work on the discoveries of Reed and his associates, our present Surgeon General, William C. Gorgas, freed Cuba of yellow fever and made possible the building of the Panama Canal, thereby establishing his claim to be called the greatest sanitary expert the world has known.

The experiments which established the mosquito theory of yellow fever transmission are so recent and well known, that I shall not enter into them except in one particular. Doctor Lazear died from yellow fever contracted while at this work. Actg. Asst. Surg. Robt. P. Cooke and several volunteers from the hospital corps slept for thirty nights in a small unventilated room, using the bedding and wearing the garments just taken from fatal cases of yellow fever, and which were soiled with the black-vomit and excretions of these patients. Major Carroll first, and subsequently several members of the hospital corps, submitted to the bites of mosquitoes which had previously fed on yellow fever victims. Several of them contracted the disease, and Major Carroll narrowly escaped death. The world at large recognizes that it requires high courage for the soldier to charge the enemy, even in the excitement of battle and surrounded by his comrades. In the present European war hundreds of medical men have met wounds and death in serving the cause of fatherland and of humanity under fire. It called for courage of a different quality, but of quite as high an order, to enable a man to submit himself, in cold blood, for experimental infection with a disease which was as mysterious, as painful and as fatal as yellow fever. All honor is due Major Carroll, Dr. Cooke, and those Hospital Corps men who stood this test in the interests of humanity and to the everlasting credit of military medicine. There is no better example of the sentiment that "Peace hath higher tests of manhood than battle ever knew."

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Original Articles.

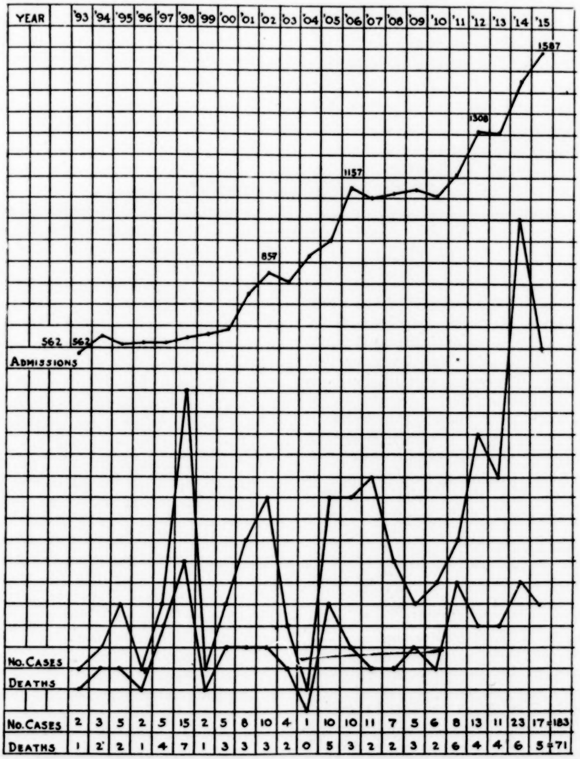
ECLAMPSIA AT THE BOSTON CITY HOSPITAL: A REVIEW OF THE CASES OF TWENTY-THREE YEARS.

By Ernest Boyen Young, M.D., Boston,

Junior Visiting Surgeon for Diseases of Women, Boston City Hospital; Assistant Surgeon, Massachusetts Women's Hospital; Instructor in Gynecology, Harvard Medical School.

During the past twenty-three years, 183 women with threatened or actual eclampsia have been admitted to the Gynecological Service at the Boston City Hospital. Thirty-six of these were admitted post-partum, having been delivered outside the hospital, either normally or by operative procedures concerning which little or nothing is known. The same applies to the details concerning the children. A few women (6 in number) were received early, as threatened eclamptics, and, after treatment, left the hospital undelivered; while 14 others, entering with mild symptoms, miscarried or were eventually delivered. Deducting the 20 milder cases, the remaining 163 cases, which include 36 received post-partum, entered usually as emergencies, often unconscious, and after convulsions had occurred. The majority, if we may judge from the records, were in very critical condition at the time of admission, and some were moribund.

The facts in the records, while interesting, are exceedingly hard to classify, and disappointing in many ways, owing to the incomplete information they contain. This, it is fair to state, has not always been the fault of those who wrote them, for many patients have entered unconscious, and still others have had neither the intelligence nor command of English to enable them to respond to the questions.



YEAR	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	
No. CASES	2	3	5	2	5	15	2	5	8	10	4	1	10	10	11	7	5	6	8	13	11	23	17	=183
DEATHS	1	2	2	1	4	7	1	3	3	3	2	0	5	3	2	2	3	2	6	4	4	6	5	=71

Chart Showing Eclampsia and its Mortality for Each Year in Relation to Total Admissions to the Service

The character of the cases upon which this paper is based may be judged from the fact that 146 had convulsions, most often multiple; 20 apparently had none; and in 17 there was no information available; although in a great proportion of this last group, it is probable that they occurred. In this paper the writer has attempted to give the facts, in so far as possible, concerning the eclamptic emergencies admitted to the Boston City Hospital, which may be classed in the main as neglected cases.

A review of the nationalities has failed to be of much value. Data as to birth were available in exactly 140 cases, and of these 29 were born in Ireland and 63 in the United States. In spite of the large number of Jewish patients treated in the wards, they number only 10 in the series, and appear to possess a great resistance to the toxemias of pregnancy, as they certainly do to puerperal infection.

A comparison of the annual number of admissions to the service during these 23 years with the number of eclamptics (threatened or actual) during the same period, shows that the incidence is irregular, and that the number treated does not correspond with increase in patients. The time of year does not seem to have any particular bearing, for although the greatest number entered in January (20), the cases are quite evenly distributed through the rest of the year.

The age in 140 patients, where this was known, was:

15-20 years	28
20-25 "	47
25-30 "	27
30-35 "	17
35-40 "	13
40-45 "	6
45-50 "	2
	140

In 138 cases in which the number of the pregnancy was available, 90 were primiparae; 16 were pregnant for the second time; and in 30 the pregnancy varied quite evenly from the third to the twelfth. There was one in the fourteenth and one in the twentieth pregnancy (15 full term, 4 miscarriages). In addition to these, but not included above, were 6 "multiparae" in whom the number of pregnancies was not stated.

The month of the pregnancy, as given, was often approximate, but the statistics in 167 cases are as follows:

5- 6 months	10
6- 7 "	18
7- 8 "	51
8- 9 "	33
9-10 "	55
	167

The statements as to duration of symptoms before entrance are of comparatively little value, and vary in time from "a few hours" to eight weeks. The symptoms of which the patients complained were those common to this form of toxaemia of pregnancy.

Three cases are recorded in which there had been eclamptic seizures during a previous pregnancy. One of these patients, then in her eighth pregnancy, had convulsions in the pregnancy preceding, and the remaining two, both in their fifth pregnancy, had each a similar attack; one woman with her first and the other with her third child. Three of the severe cases were too near death to deliver.

All the urinary examinations showed albumen, with one exception, and in this instance the patient recovered. Jaundice is mentioned but once and this patient died on the seventh day.

Convulsions were stated to have occurred in 146 of the 166 cases with available information on this point. This includes all admitted to the wards, before and after delivery. The seizures were multiple in most instances and the condition of some, not included because details were wanting, would indicate that convulsions had taken place before admission.

The following table gives the statistics of 166 cases with reference to convulsions:

Convulsions before delivery	83
Convulsions after delivery	32
Convulsions before and after delivery	27
Convulsions during and after delivery	4
No convulsions	20
	166

Although 20 had no convulsions, 14 of these were delivered because of "threatened eclampsia" or delivered themselves by spontaneous abortion. Six were discharged undelivered.

The mortality of the series is appalling, but considering the circumstances, it is surprising that the results are even as good. In the first place, it must be remembered that a great number of these women were examined outside the hospital; that most had received no treatment, and that some were even found by chance—as one woman lying in the bottom of a closet; another comatose in bed with a foetus beside her, which had been born during the convulsions. Many have been received moribund or in a condition offering little hope of benefit from any procedure.

The deaths compared with the admissions appear in the chart, so it will suffice to say that of 183 cases, including all those admitted to the wards at any stage, 112 recovered from the toxaemia and 71 died—2 of the latter from sepsis after some weeks of sickness. Three were too far gone to deliver. Of the 36 women admitted post-partum, and included in the figures above, 23 lived and 13 died. Many of these were apparently delivered normally at full term, and, having convulsions, were sent to the hospital.

In 130 cases, including 3 delivered outside the hospital, the results for the mothers, delivered by various methods, were as follows:

		RECOVERED	DIED
Forceps	24	19	5
Version	64	29	35
Non-operative delivery	37	29	8
Vaginal Caesarean	4	1	3
Abdominal Caesarean	1	1	0
TOTAL	130	79	51

Manual dilatation was employed in many of the severe cases. Of 49 cases where the cervix was opened by this method, without using the Voorhees bag, 31 recovered and 18 died.

There were also five cases where multiple incisions of the cervix were tried,—apparently in combination with some form of dilatation,—and of these, 1 survived and 4 died.

The Voorhees bag was used in 22 cases. Four non-operative deliveries recovered, one of which had a blood pressure of 210 at the time of admission, and 3 died.

Of 15 operative deliveries 3 died, 2 of these after use of the bag at the start, with blood pressures of 210 and 220 respectively. Twelve recovered,—one with a blood pressure of 190. Fourteen of the 15 operative cases were delivered with forceps or by version, and in one the method of delivery was not stated. In two, the dilatation of the cervix was completed manually.

The number of the convulsions and the time of their occurrence are unobtainable in many cases, owing to the manner in which the cases are received—often with no history. In the series of 166 cases previously considered, of 83 women, with convulsions before delivery, 29 died; of 32, with convulsions after delivery, 10 died; of 27 with convulsions before and after delivery, 13 died (1 sepsis); and of 4 with convulsions during and after delivery, 3 died (1 sepsis). There were 20 cases with no convulsions and a mortality of 3.

The mortality among the 146 women with convulsions at some time during the toxaemia was 55; two dying of sepsis.

As would be expected, the longer the convulsions continued, the more deep the toxaemia and the worse the prognosis.

Figures concerning the mortality of the children are unsatisfactory. Many of our patients do not know the duration of their pregnancy, and often no data can be obtained. Thus many of the ages given were simply approximate and the figures, for living children, represent only those who apparently left the hospital alive.

Considering a seven months child as viable, in 125 deliveries there were 99 viable children (2 pairs twins), 33 of whom survived. Of 31 viable children born by normal labor, 21 died; while in 67 labors, 68 children (1 pair twins) were delivered by operative means, with a mortality of 52. There seems to be comparatively little difference in outcome between operative and normal deliveries as far as the child is concerned. This is undoubtedly due to the fact that many of the babies were premature, and their mothers extremely toxic. On the other hand, the cases where low forceps were used are included and would tend to help out the operative record.

The results of operative and non-operative treatment on both mothers and children have been considered. In looking over the records, the writer often finds it difficult to differentiate between mothers dying of toxaemia and those already weakened who perished from the shock of delivery. The number of convulsions, pulse rate and blood pressure are not by any means infallible guides as to how an eclamptic will bear operative delivery, and the writer, watching the results of the various methods, has changed his opinions somewhat regarding immediate delivery by heroic measures. Many apparently hopeless cases survive a long operative delivery; and some, in apparently the same condition, fail to recover after very simple procedures. Under all circumstances the shock of an operative delivery is considerable, although many of those so delivered would doubtless perish under any form of treatment. It is usually in the milder cases that more gentle and prolonged methods of delivery are apt to be employed, although they appear, from the experience of the writer, equally effective, if not more necessary, in many of the severe cases under discussion.

Owing to the serious condition of most of these patients, the milder, rather than the more immediate and strenuous methods seem better suited for their delivery, and the latter should be used only when the former appear inadequate. Some patients may possibly be lost by delay, but more will be saved by the avoidance of shock.

In primiparae (except in the very early months) both where labor has not begun and where there is partial dilatation and a rigid os, most serious cases may be delivered by the use of the dilating bags; while in multiparae they are often still more effective. By this means we are imitating the processes of nature by which the best results in delivery appear to be attained.

Whether the irritation of the bag in the uterus tends to continue or to excite convulsions is a question upon which the writer is as yet undecided. Most excellent results have been obtained by their use in desperate cases, and there have been unfavorable results as well.

Although delivery is lengthened in some, there is much less shock, less liability to laceration of the cervix, and less chance of sepsis, even though manual dilatation is used to complete the task. A rigid os frequently softens and manual dilatation, if necessary, is more readily accomplished. The fact should be pointed out that Voorhees bags alone were used in some cases too sick for operative delivery.

For the vaginal Caesarean section as a means of immediate delivery, the writer sees no advantage in the clean cases advanced beyond 6 months; since the operation is difficult in primiparae under any circumstances. In multiparae it is also difficult, if the cervix is high in the pelvis. After the uterus is opened, the labor must still be ended by forceps or version and the repair is long and tedious. There were but 4 cases in this series, 3 of which were operated *in extremis* and fatal; one dying on the table.

Abdominal Caesarean section has been performed once. The writer believes it proper in certain cases where immediate delivery appears necessary and other methods seem too prolonged, uncertain and difficult, because of the size of the child or the condition of the cervix.

The relation of blood pressure to prognosis and treatment is a matter of great interest in the severe types; but the available data are too small for absolute conclusions. Of 42 cases with data available, 12 died. Three died out of 7 with a pressure of 200 or over; 9 others died with pressures varying from 104 to 160; while 30 cases, varying from 210 to 706 and with an average systolic pressure of 157, all recovered.

The methods of delivery were so dissimilar that no comparison could be made to show the influence of any special method of delivery upon results.

High blood pressure makes the outlook less hopeful, but does not necessarily mean a fatal outcome. Diminution of pressure after delivery is a hopeful sign.

The number of venesections is too small for reliable statistics, especially concerning a procedure where judgment as to worth depends so much on an intimate knowledge of the individual case. It has been tried in the cases with high pressure and usually in severe types after delivery.

There were 18 venesections, 9 of whom recovered and 9 died. Six of the 9 mortalities were in cases received post-partum, and two of those who recovered were likewise admitted after labor. One patient died undelivered.

In ante-partum venesection, the writer has little faith, except in certain plethoric individuals, and believes it should be employed with the greatest care at this stage. It is not possible to foretell either the amount of blood which will be lost during birth or the reaction of a toxaemic patient to the strain of delivery.

Venesection is often of great advantage in the strong, healthy, full-blooded, restless individual, where blood pressure remains high or has a tendency to rise after delivery; but in those who are frail or fat and flabby its advantages are very doubtful. Loss of blood lowers the resistance to infection, to which all cases of toxaemia of pregnancy are very susceptible.

During bleeding the blood pressure should be carefully watched and not allowed to fall below normal; while to all cases of venesection, fluid should be administered either by rectum or by hypodermoclysis where the first method is not available. Additional fluid is not required by patients with oedema of the tissues.

The medical treatment has been along the usual lines,—free catharsis, gastric lavage, control of convulsions by sedatives and ether, enteroclysis, hypodermoclysis, and hot packs in some cases. Sweating has not been used so often during the latter years. It has appeared to be of doubtful efficacy, and distinctly detrimental to some.

The fact that patients, too sick for safe operative delivery, sometimes recover under medical treatment is often forgotten in the desire to obtain immediate results. The Voorhees bag may be advantageously combined with medical treatment. There are a number of cases in the present series where delay in obstetric surgery has been followed by recovery, when operative measures would have been fatal for the mother. Each case must be considered by itself and no general rule can be applied; except that the method adopted for delivery should be the gentlest and most efficacious for that individual.

From what has gone before, it is clear that results with the class of cases received in our wards cannot be as good as one would wish, but are about what might be expected. On the whole, the mortality seems to be lessening. Unfortunately this cannot be ascribed to treatment alone, as the severity of eclampsia varies in different years.

This series is published in the hope that it may aid in some larger collection of cases.

The conclusions reached have been deduced from a study of the cases and are not all capable of proof by statistics alone.

CONCLUSIONS.

1. Incidence varies greatly in different years and without apparent cause.
2. Severe attacks occur mostly in primiparae from 20-25 years, in the latter half of pregnancy.
3. A little over one-half the cases with convulsions have seizures after delivery.
4. Non-operative delivery is most favorable for the mother.
5. The longer the convulsions continue, the greater the mortality.
6. Child mortality is high whether deliveries are operative or non-operative, owing to prematurity and toxaemia.
7. High blood pressure increases the gravity of the prognosis.
8. Venesection is a useful procedure in cases with high pressure and restlessness after delivery.
9. Induction of labor and delivery with the least possible operative interference offers the best chance of recovery for the mother.
10. Caesarean section is justified in certain cases where delivery by other methods seems too prolonged or doubtful in outcome.

REMISSIONS IN LEUKEMIA PRODUCED BY RADIUM IN CASES COMPLETELY RESISTANT TO X-RAY AND BENZOL TREATMENT.[*]

By Thomas Ordway, M.D., Albany, N. Y.,

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Those who have had extensive personal experience with and opportunity for intensive study of leukemia recognize that there have been cases which did not respond to treatment by x-ray or benzol. Indeed, following the use of benzol, serious, even fatal, results have been reported, and toxic symptoms also may occur after the use of the x-ray. In certain instances benzol may cause a short period of temporary improvement followed by rapid fatal termination.[1] Such termination also may occur with other forms of treatment or without treatment. With the more recent improvements in x-ray apparatus by Coolidge and his co-workers, and by perfection in the technic of clinical application, it is probable that the number of cases which are refractory to x-ray will be considerably lessened.

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[*] Presented before the Association of American Physicians, May, 1916.

Renon, Degrais and Tournemelle[2] in an admirable article add a sixth case of leukemia to the five already reported by them. They also refer to the French series of twelve cases of leukemia in which marked improvement resulted from the surface application of radium over the enlarged spleen. Eight of these had already been treated with Roentgen rays with no advantage or only with temporary improvement. Pinch of the Radium Institute of London[3] also makes reference to a case of myelogenous leukemia in which the results of radium treatment were excellent. Von Noorden and Falta[4] did not obtain any favorable results in leukemia by the use of radium emanation even by prolonged treatment in the emanatorium. Falta, Kriser and Zehner[5], however, produced remissions in leukemia by the injection of thorium-X. In the small series of cases reported by them the immediate results were good, but the cases had been followed only a very short time, so that they did not draw any conclusions regarding end results of this treatment. German investigators have reported conflicting results from treatment of leukemia by thorium-X.

METHODS.

Benzol. The methods of administering benzol in the treatment of leukemia have now become almost uniform. Capsules, in certain instances coated with salol, containing 0.5 gram of benzol, are given with equal parts of olive oil to diminish the irritating local effect. Two of such capsules are given at first, increasing until ten, that is, five grams a day are administered. They should be taken immediately after meals and never during meals and it is important that patient should be kept in the hospital during such treatment.[6] It may take ten days to three weeks before the effect upon the blood is observed. It is customary to stop administration when the white count in leukemia has been reduced to 20,000. Boardman states that sixteen out of one hundred cases fail to show improvement and that another eight cases, although reacting favorably at first, died during or soon after the discontinuance of treatment. Also certain toxic effects have been reported such as gastro-intestinal disturbances, headaches, dizziness, skin eruptions, bronchial and kidney irritation and hemorrhages. Marked leucopenia with increasing anemia and death may occur.

X-Ray. The technic for treating leukemia by the Roentgen ray has been very variable and this may account to a certain extent for the variations in the results obtained. Boardman (*loc. cit.*) states that the x-ray has produced improvement in from 20% to 50% of the patients, that is, 50% to 80% of the cases are refractory. In most cases the long bones as well as the spleen have been radiated. In many instances, however, too little attention has been paid to the principles of cross fire and filtration (deep therapy). The principle of the so-called "*cross-fire*" is important for the successful application of radium or x-rays to large growths or to deeply seated lesions. The method was first described by Domenici and has since been elaborated by others, notably in the treatment of uterine fibroids by x-rays in the Freiburg clinic by Kroenig and Gauss. The aim is to concentrate as much of the action of the rays as possible in the deep-seated lesions with the least possible injury to the overlying skin. This may, in certain instances, be accomplished by employing small tubes of radium scattered throughout a tumor mass or by surface applications of heavily screened radium or x-ray to a large number of areas on the skin so that each area will not be exposed too long or too intensely. This might be the result in applying the radium to a single area for the time necessary to produce the desired effect on the underlying lesion. By this cross-fire method enormous doses, even 1,000 to 1,500 Kiemboeck units, may be applied to the deep lesion when not more than 20x could be safely put through one particular surface area. Pfahler uses from 4 to 40 surface areas and passes a full dose through each, making a total of from 80 to 800 units.

To produce any marked effect upon the deeper tissues it is necessary to use screens or filters to check the less penetrating rays which would otherwise be absorbed by the superficial tissues and cause marked destructive changes there before the less numerous and more penetrating rays could act on the deeper tissues. In order to obtain the most penetrating x-rays for this method of so-called "deep Roentgen therapy," the well known "Tiefenroentgentherapie" of the Germans, it is necessary to employ a hard tube of high degree of vacuum and an electrical apparatus of high voltage. The rays are not all of equal penetrability and it has been found that they are more homogeneous when the softer have been "filtered out" by an aluminum screen 3 millimeters in thickness. Certain roentgenologists also use a heavy piece of leather.

Radium. When radium is used for the treatment, screens or filters of lead 2 to 3 millimeters in thickness, of brass 1.2 millimeters or other heavy metals such as silver, gold or platinum, allow the penetrating hard beta and gamma rays to pass and intercept the alpha and soft beta rays which would otherwise be absorbed and cause destructive changes in the superficial tissues. As the amount of the more penetrating rays is only a small proportion of the total activity, less than 5%, it is necessary in deep therapy to make exposures correspondingly long.

The principles of cross fire as well as deep therapy are made use of in the treatment of leukemia by surface applications of radium. The technic of such radium therapy may be illustrated by the striking effect of radium when applied in the proper manner to the surface over the enlarged spleen in cases of myelogenous leukemia. For this the following details have been elaborated.

The area of the enlarged spleen is carefully and plainly marked out with skin pencil or grease paint (of red or black color), the outline being obtained by percussion and palpation. The various landmarks, such as the costal margins, anterior superior spine and crest of the ilia, the symphysis pubis and the umbilicus are marked. The patient is photographed in an erect position in both front and side views (Figs. 1 and 2). A series of small squares 3 cm. in diameter, when the radium applicator is 2 cm. in diameter, are marked over the area of the enlarged spleen. It is important not to have the successive application areas too near together or the skin between them will be "burned" by the double dose. The squares thus marked out are numbered serially. A swathe of thin cotton cloth is carefully fitted to the abdomen, and the outline of the spleen, bony landmarks and small squares is traced upon it. This swathe must be smoothly and accurately fitted and kept in accurate position by means of the landmarks above mentioned, for it is left in place during each single series of treatments. The purpose of this swathe is to avoid the irritation of repeatedly applying and removing the adhesive plaster which holds the radium applicator in place, for it has been found that the area which is being, or has been, radiated is particularly sensitive to injury from the repeated application and removing of adhesive plaster. Indeed, such added irritation may induce vesiculation or even superficial ulceration of the skin. Tracings of the areas and landmarks marked on the swathe are now made on tracing cloth, which serves as a chart for guidance in the following series of treatments. The general method of charting will be seen by the accompanying illustrations (Figs. 3, 4, 5 and 6). This affords a convenient and accurate method of recording the changes in the size of the spleen, and in avoiding injury to the overlying skin in the effort to give sufficient radiation to the underlying lesion. With the chart as a guide, the radium applicator, screened with 2 or 3 millimeters of lead, 15 to 20 thicknesses of filter paper, and wrapped in gauze, is now applied to each of the squares in the order indicated. It is necessary also to add at least as much filtration and protection to the *external* side of the applicator, for the patient may inadvertently rest the arm or leg on the applicator during sleep, and a severe burn may thus result. The filter paper is applied to avoid the irritating effect of the secondary rays from the lead, and the

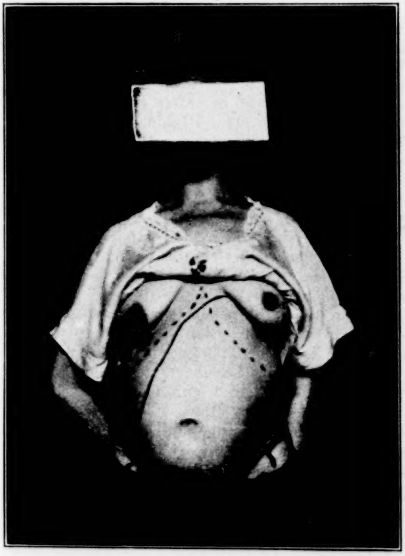

FIG. 1. Photograph of patient November 5, 1915, showing the outline of the enormously enlarged spleen and the prominence of the bony framework. The costal margins, crests and anterior superior spines of the ilia are also outlined. (Front view.)

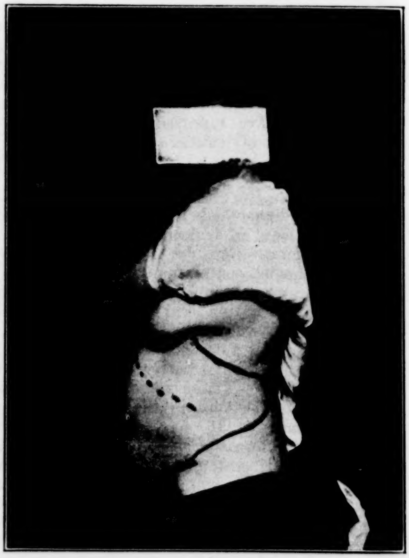

FIG. 2. Same as Fig. 1, November 5, 1915. (Side view.)

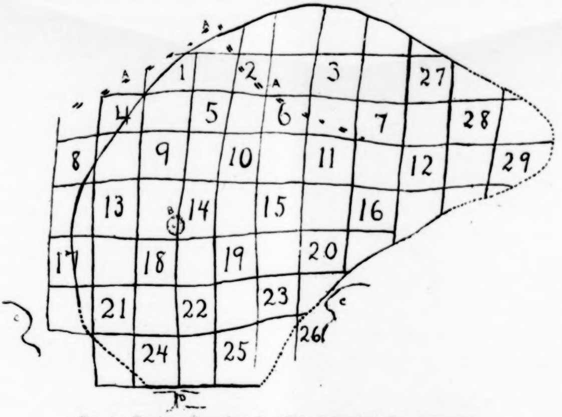

Fig. 3. Tracing, November 5, 1915, indicating the areas over the enlarged spleen exposed in the *first* series of radium treatments. The costal margins, umbilicus, crests and spines of the ilia and symphysis pubis are also indicated.

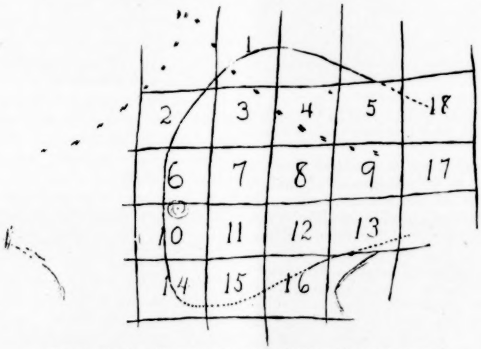

Fig. 4. Tracing, December 18, 1915, showing the areas exposed in the *second* series of radium treatments and the marked reduction in the size of the spleen.

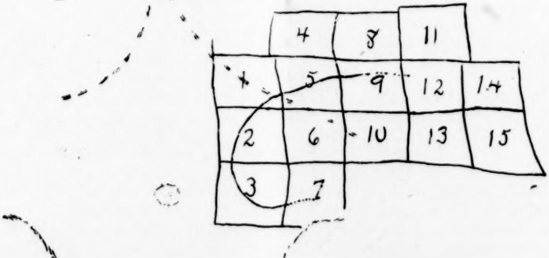

Fig. 5. Tracing, January 27, 1916, showing the areas exposed in the *third* series of radium treatments and the marked reduction in the size of the spleen.

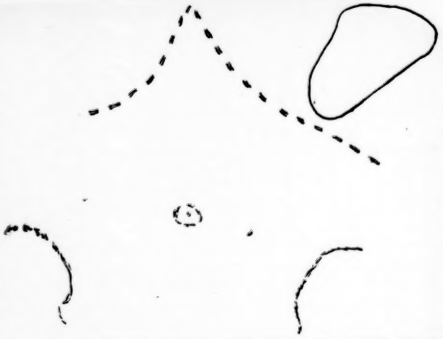

Fig. 6. Tracing, April 15, 1916, showing the marked reduction in the size of the spleen which cannot be felt below the costal margin. The costal margins, the umbilicus, the ilia and the symphysis pubis are also indicated.

gauze adds to the comfort of the patient. If it is desired, the applicator may be rendered even more comfortable by substituting 25 to 30 layers of gauze instead of the filter paper. After from four to six weeks a second series of treatments is usually necessary, the interval between being determined by examinations of the blood and by the local condition of the skin. If the details here described are followed, however, no effect will be produced upon the skin other than very faint pigmentation after several series of radium treatments. The size of the spleen and the bony landmarks should be marked out, a new swathe fitted, and tracings made at each series.

Duration of Application and Amount of Radium Used. When from 50 to 60 milligrams of radium element or millicuries of radium emanation are employed, evenly distributed over a surface applicator 2 x 2 cm. in diameter, and the filtration and protection above mentioned is used, the radium may be left in each position from 4 to 6 hours—4 hours if there are 60 milligrams, 6 hours if there are 50 milligrams and if the filtration is 3 millimeters of lead. With this amount of radium and the above technic, it is possible for complete remission in leukemia to occur with three series of treatments. Amounts of radium, however, as small as 25 milligrams, even when this is in the form of a tube, have reduced the spleen to normal size, and have caused the characteristic improvement in the blood and in the general condition of the patient, but the time required is longer and the series of applications more numerous.

Discussion. In practical radiotherapy radioactive substances will in certain instances doubtless be preferable to the use of the Roentgen rays, particularly when there is necessity for the most precise localization, especially within the body or in cavities difficult of access and also when the condition of the patient or circumstances demand portability of the therapeutic agent for convenience or ease of treatment. The disadvantages of radium are its great expense for sufficient dosage in certain cases and also the possibility of loss of the radium salt by accident or theft. The latter may, however, be obviated by the use of emanation, or radioactive gas evolved from a solution of radium, but the expense is thereby increased because of the necessity of retaining a physicist and equipping and carrying on a physical laboratory. When sufficient clinical experience has been gained in the application of the recent advances in the production of highly penetrating homogeneous x-rays of great volume by Coolidge and his co-workers, supplemented by careful scientific study of the physiological effects, it is believed that there will be in the majority of cases very little difference in the therapeutic value of the x-rays and radioactive substances. With the use of more powerful Roentgen apparatus, which is now being elaborated, physiological standardization is deemed of utmost importance in order that the best results may be obtained and the danger to patients obviated. It seems possible that similar results to those now produced by radioactive substances may be brought about in a much shorter time by the x-ray when the desired quantity and quality of the radiation may be measured in a rational manner so that the results obtained by one man may be compared with those of others and that there may be a repetition of results from day to day. From the preceding it will be seen that each source of radiation has certain advantages, as well as disadvantages. Unless in the near future the cost of production and the selling price of radium is greatly reduced it would seem, with the recent development in the x-ray that the latter will become of more general use in the treatment of many diseases.

It has been the practice of many roentgenologists to radiate the long bones as well as the spleen in cases of myelogenous leukemia. In the writer's experience, however, it has not been necessary or, indeed, seemed advisable, when radium is used as the therapeutic agent, to radiate the long bones. Surface applications of radium over the enlarged spleen in the manner above described produces most remarkable improvement with striking changes in the size of the spleen, the blood picture and the general condition of the patient. In the course of a few weeks, or in certain instances in three or four months, after radium treatment by surface application a spleen which filled almost the entire abdomen and extended well to the right of the median line and into the pelvis (Figures 1 and 2) and caused marked pressure symptoms has been reduced to normal dimensions so that it was not palpable below the costal margin (Figure 9). The white cells in the blood were reduced from 500,000 to 6,000, the immature forms being especially affected. The hemoglobin increased from 60 or less to 90%. Red blood corpuscles may increase from 2,000,000 to 5,000,000. The abnormal blood cells, myeloblasts and myelocytes disappear. Indeed, the blood picture returns almost to normal although some variation in the size of the red cells may per-

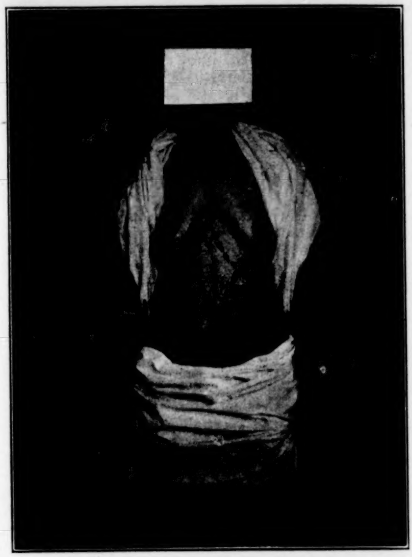

FIG. 7. Photograph of the patient January 31, 1916, showing the improved nutrition and the marked reduction in the size of the spleen. (Compare with Fig. 1, front view.)

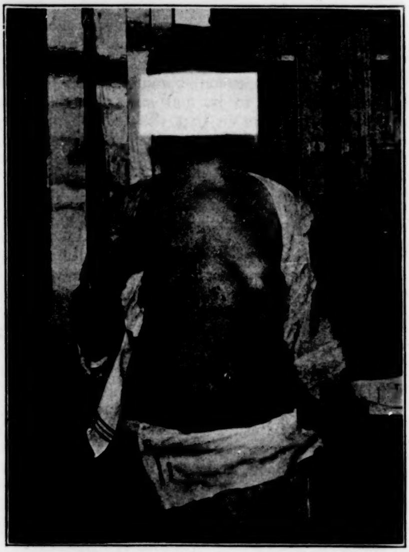

FIG. 9. Photograph of patient April 15, 1916, showing greatly improved nutrition and indicating the marked reduction in the size of the spleen which was not palpable below the costal margin.

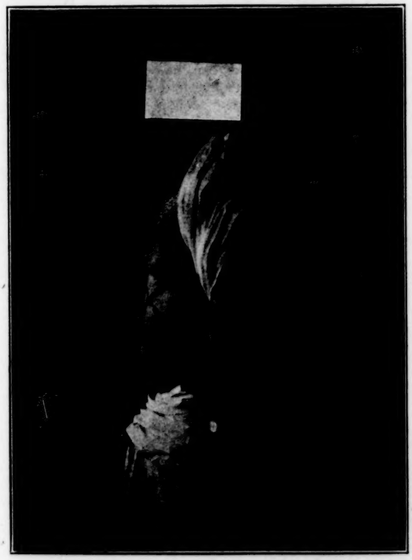

FIG. 8. Same as Fig. 7, January 31, 1916. (Side view.)

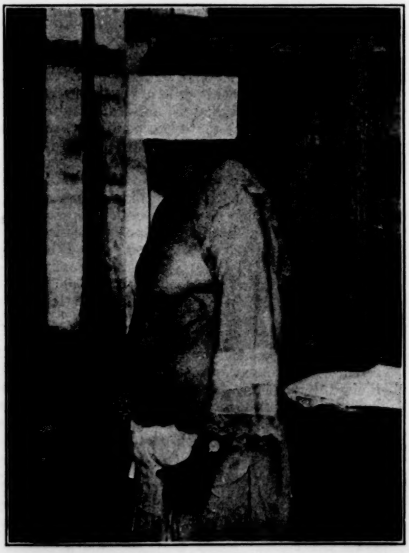

FIG. 10. Same as Fig. 9, April 15, 1916. (Side view.)

sist and there may be relative lymphocytosis. A pale, emaciated, anxious individual with prominent bony framework, stooping shoulders and enormously enlarged abdomen usually loses the anxious expression, becomes plump, the abdomen returns to normal size, the color and strength improve so that the patient may feel entirely well. The pathological condition, however, sooner or later is apt to relapse and response is less prompt in subsequent series of radium treatments. Some of the patients treated with radium have been followed for a number of years and kept in good condition by the occasional repeating of radium treatments. Certain cases, however, similarly treated have died of intercurrent infection or have succumbed to the original disease.

Striking changes are found in the urine of patients with myelogenous leukemia treated by radium. There is a marked increase in the total nitrogen, urea nitrogen and ammonia nitrogen. The uric acid is slightly increased. The total phosphates are increased remarkably. There is apparently no accumulation of uric acid in the blood, at least when the kidneys are in normal condition. Because of this marked increase in the metabolism it seems advisable to have the patient on a purin-free diet during and following the series of radium treatments. The changes in the metabolism of patients treated by radium resemble in certain respects those resulting from treatment by x-ray.

From the clinical point of view there is particular interest in the effect of radium upon cases which have proved completely refractory to x-ray and benzol treatment and of these the following record is an example.

Illustrative Case. The patient, Mrs. A., thirty years old, first consulted her physician April 11, 1915, for an obstinate, hacking, unproductive cough, which had at that time persisted for about a month. The cough was somewhat spasmodic, so much so that whooping cough had been suspected. She stated that she had also had "inflammation of the eyes," which had been treated by an oculist for three days with ice compresses. On April 11 general examination by the patient's physician disclosed a greatly enlarged spleen, and a blood examination two days later was as follows: red blood cells, 3.750.000; white blood cells, 280,000; hemoglobin, Sahli, 62%; polymorphonuclear leucocytes, 53%; lymphocytes, 4%; eosinophiles, 2%; large mononuclears, 2%; myelocytes, 39%.

The cough became so troublesome that it interfered with the patient's sleep, and the uvula was incised by a laryngologist, without effect, in the hope that it might improve the symptom. The patient was given sodium cacodylate, grains 3/4, subcutaneously, twice a week from April until July, but there was no improvement. The cough continued and the abdomen constantly grew larger. From April to June the waist increased three inches in circumference, and the abdomen continued to increase, until the first week in November, 1915, the patient stated that the enlargement and pressure sensations corresponded with those of pregnancy at eight months (Figs. 1 and 2). The increasing pressure caused great annoyance from the lessened control of the bladder due to an old laceration at childbirth. Not only did the troublesome cough persist, but the patient became more and more short of breath and perspired freely. Perspiration was most noticeable in the legs. During the latter part of the summer and the early fall, the perspiration was so marked, the sheets were wet and the weakness much increased. In the early part of July the sodium cacodylate was stopped, and on July 15 x-ray treatment was begun and continued every other day until September 13. On September 18 the patient went to Baltimore, where she was seen in consultation with Dr. Louis Hamman, who, on September 23, sent to the patient's physician the following report:

"Mrs. A. came to Baltimore for an examination, and through Dr. H. H. Young was referred to me. I am sure that I will add nothing new in what I have to say; but I was anxious to have the opportunity to report to you the results of the examination.

"The general physical examination shows nothing abnormal except the pallor of the skin, and a tremendously enlarged spleen. The spleen reaches well beyond the middle line, and below descends into the pelvis. The blood shows: hemoglobin, 58%; red blood corpuscles, 2,912,000; white blood corpuscles, 460,000. The hemoglobin reading may be a little too high, since the 'muddiness' of the blood makes an exact reading difficult. A differential count of 500 cells gave the following proportion: polymorph. neuc. neut., 58.2%; polymorph. eosinoph., 2%; polymorph. basoph., 2.6%; neutroph. myelocytes, 31.6%; eosinoph., 1.2%; lymphocytes, 1.4%; large mononuclear cells (including myeloblasts), 3%. In counting 500 cells, 2 normoblasts and 1 intermediate form of nucleated red cell were seen.

"Mrs. A.'s condition, therefore, is typical of the chronic form of myeloid leukemia.

"Mrs. A. states that she has been treated with the x-ray, and that she has had injections, which I presume were injections of some form of arsenic. Apparently, little improvement has followed the treatment, since the blood, according to her statements, has remained practically stationary. This being so, I think it is very important, while Mrs. A.'s general condition is still good, that treatment be undertaken more radically. The things that I would propose are these:

"First. I think that she should be absolutely in bed, if possible, out of doors. Since it would be difficult for her to be in bed at home and receive the proper x-ray treatments, she would be much better off in a hospital. Of course, the diet should receive appropriate attention.

"Second. The x-ray treatment should be continued. The exact method of application must be left to one experienced in x-ray work; but I think it should be pushed energetically.

"Third. I should advise a thorough and energetic course of benzol treatment.

"I outlined this plan to Mrs. A., and she was somewhat undecided whether she would enter the Johns Hopkins Hospital for treatment, or whether she would return and enter the Hospital at Albany. I told her that I would write you fully about my examination, and that it would be best for her to leave the decision whether she should remain at home or should come to Baltimore for treatment, entirely in your hands. This she has decided to do, and will consult you as soon as she returns home."

On October 1 the patient entered the Albany Hospital, and x-ray treatment was continued without any effect, until October 25. In all, 37 areas were exposed, including practically all the long bones and the area of the enlarged spleen. Dr. Howard had immediate charge of the x-ray applications, under the supervision of Dr. John M. Berry, roentgenologist of the Albany Hospital. The technic was as follows:

Spark gap varied from six to eight inches; filter, 3 millimeters of aluminum; tube distance, 10 to 11 inches; current, five to eight milliamperes; and the time of each exposure varied from five to ten minutes.

Over the spleen a cone of 1 in. in diameter was used, over the long bones one of 3 inches in diameter. On October 25, through the courtesy of Dr. T. F. Doescher, the patient's attending physician, I had the opportunity of studying the case. I would also express my thanks to Dr. Doescher for the large number of blood examinations made by him. At this time the patient was sitting comfortably in bed, skin and mucous membranes were somewhat pale, the breathing was slightly rapid and shallow. The bony framework of the chest was prominent (see Fig. 1). The left border of cardiac dullness was 14½ cm. to the left of the median line, the right border 2 cm. to the right of the median line. The upper border was in the second space. The first sound of the apex was rather short, and somewhat resembled the second. There were no murmurs. The lungs showed normal resonance and respiration throughout, except at the right base posteriorly, where, extending midway to the angle of the scapula, there was moderate dullness and a few fine moist râles. The upper border of the liver dullness anteriorly was at the fourth space, the lower border 2 cm. below the costal margin. The abdomen was enormously distended and about the size of pregnancy at eight months. A large mass, apparently the spleen, filled almost the entire abdomen except the right upper quadrant. In the left mid-axillary line the upper border of splenic dullness was at the seventh rib. The right border of the spleen on the level with the umbilicus was 7½ cm. to the right of the median line and on a level with the anterior superior spine, the right border was 8 cm. to the right of the median line. The splenic notch was distinctly felt. Anteriorly, the mass could be felt extending into the pelvis (see Figs. 1, 2 and 3). Extremities: the reflexes were normal; no edema. Glands: there was no general superficial glandular enlargement. A radiograph of the chest, made by Dr. John M. Berry, showed a general haziness of the lungs and a faint shadow at the right base, apparently due to thickened pleura.

Past History. Patient had whooping cough when eight years old, measles at nine, and pneumonia with pleurisy at thirteen. When three years old she had chronic conjunctivitis, and has worn glasses for years. She has two children, six and two years old. Both are well. She has had no miscarriages. Catamenia was regular every five weeks before September, 1915. On September 5 was scanty, and since then has been absent. Average weight has been 155 pounds.

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Radium Treatment. At a consultation of Dr. Arthur W. Elting, Dr. T. F. Doescher and Dr. Thomas Ordway with the patient's husband, the advisability of radium treatment was thoroughly discussed, and it was explained to her husband that, notwithstanding the fact that the former methods of treatment, including arsenic, x-ray and benzol, had not produced any improvement, it was possible that radium treatment by surface application over the spleen might induce a remission. It was carefully explained, however, as probable that even if the general condition improved and the spleen became reduced in size to approximately normal, that the condition would merely be regarded as a remission, and not in any sense a cure. It was suggested that if such a great reduction in the size of the spleen and improvement in the general condition of the patient occurred, splenectomy might then be considered. Owing to the courtesy and coöperation of Drs. James Ewing and R. S. Bosworth, of the General Memorial Hospital in New York City, radium emanation was obtained for treatment.

Radium Treatment, Series I. November 6, 1915, 6 p.m., 49.5 millicuries of radium emanation in square applicator, 2 cm. by 2 cm., was applied to the abdomen to area No. 1 (see Fig. 3) for four hours. It was applied successively to the consecutive areas for a similar time. The filtration used was one millimeter of silver, one millimeter of lead, twenty sheets of ordinary filter paper, ten layers of gauze, applied by adhesive plaster to a fitted swathe of cotton cloth. When twenty-two squares had been covered in the manner above described, the strength of the radium was approximately 25 millicuries. November 22, the general condition of the patient was good, the spleen somewhat smaller, and the abdomen was distinctly softer.

Radium Treatment, Series II. December 18, 1915, 60 millicuries of radium emanation were applied to the surface over the area of enlarged spleen (see Fig. 4), using the same technic as in series No. 1, except that three millimeters of lead was used for filtration, and the radium was left for six hours on each of the areas indicated on the chart. On this date the spleen was very much smaller, the general condition of the patient was excellent as to strength and color, and the troublesome cough had entirely disappeared. The second series of radium treatments was ended December 22.

Radium Treatment, Series III. January 27, 1916. Applications were started at 7 p.m. The applicator contained 61 millicuries of radium emanation at 12.15 p.m. of this same date. The spleen is very much smaller, and occupies only the left upper quadrant (see Fig. 5). The radium was applied to each square as indicated on chart for six hours. Three millimeters of lead was used for filtration, and the same amount of paper and gauze as in series No. 1.

January 31, 1916. Third series of radium treatments concluded. Gross photographs (see photographs Figs. 7 and 8) show the improved nutrition of the patient and marked diminution in size of the splenic area. Patient's weight, 143 pounds. Corrected weight, deducting five pounds for clothing, 138 pounds. White blood count, 28,000. General condition, excellent.

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Radium Treatment, Series II. December 18, 1915, 60 millicuries of radium emanation were applied to the surface over the area of enlarged spleen (see Fig. 4), using the same technic as in series No. 1, except that three millimeters of lead was used for filtration, and the radium was left for six hours on each of the areas indicated on the chart. On this date the spleen was very much smaller, the general condition of the patient was excellent as to strength and color, and the troublesome cough had entirely disappeared. The second series of radium treatments was ended December 22.

Radium Treatment, Series III. January 27, 1916. Applications were started at 7 p.m. The applicator contained 61 millicuries of radium emanation at 12.15 p.m. of this same date. The spleen is very much smaller, and occupies only the left upper quadrant (see Fig. 5). The radium was applied to each square as indicated on chart for six hours. Three millimeters of lead was used for filtration, and the same amount of paper and gauze as in series No. 1.

January 31, 1916. Third series of radium treatments concluded. Gross photographs (see photographs Figs. 7 and 8) show the improved nutrition of the patient and marked diminution in size of the splenic area. Patient's weight, 143 pounds. Corrected weight, deducting five pounds for clothing, 138 pounds. White blood count, 28,000. General condition, excellent.

February 26, 1916. White count, 13,000. General condition, excellent.

April 15, 1916. Photographs taken (see Figs. 9 and 10) showing greatly improved nutrition and general condition of the patient, and marked reduction in the size of the splenic area (see tracing, Fig. 6). Spleen is no longer palpable below the costal margin. Weight, 156¼ pounds; corrected, for clothes, 151¼ pounds. Patient has gained 13¼ pounds in weight since January 31, 1916, notwithstanding the great reduction in the size of the spleen. The muscles are firm, color and strength are good, sleep, appetite and general condition are excellent. The cough, which had been exceedingly troublesome, and had not responded to local or general treatment, entirely disappeared a short time after the first series of radium treatments, and has not returned. The catamenia, which was regular every five weeks before September, was scanty on September 5, then it did not occur until November 25, after which it was regular every three to three and a half weeks.

Except for slight variation in size and shape of the red cells, the blood examination was practically normal. The red blood cells, 4,800,000; white blood cells, 5800; the hemoglobin, 90%; the polymorphonuclear leucocytes, relative number, 50.3%, absolute number, 2917; lymphocytes, relative number, 45.7%, absolute number, 2650; myelocytes, none; eosinophiles, relative number, 0.3%; large mononuclears, relative number, 3.1%; mass cells, relative number, 0.6%; number of cells counted, 322. No blasts seen.

May 15, 1916. General condition of the patient has continued to remain excellent, and she has been about actively and tended to her usual duties. As she has been upon her feet much more, owing to her improved general condition, the frequency of micturition, from lessened control of the bladder due to an old ulceration at childbirth, caused considerable annoyance, so that she entered the Albany Hospital on May 3, 1916, and was operated upon by Dr. John A. Sampson. The possible danger of general anesthetic was thoroughly discussed, and gas and oxygen were used instead of ether, because they seemed safer. Patient had considerable post-operative pain, but the wound of pelvic repair operation healed normally.

On May 15, the white cells were 8000 and the red cells 4,600,000.

June 15, 1916. Pain resulting from the operation mentioned under last note, is relieved, but patient is bothered with neuralgia, apparently due to teeth. White count, 6040; red count, 4,580,000; hemoglobin, 90%.

June 27, 1916. Owing to the persistent neuralgia, the patient's dentist, Dr. LeRoy S. Blatner was consulted, and on June 25 he found the condition to be due, apparently, to a crowned tooth, which had broken and exposed the nerve. As he was not able to secure satisfactory anesthesia by such local measures as cocaine or arsenic, the patient was given oxygen and nitrous oxide anesthesia and the nerve removed. The tooth was not extracted. After this the pain was relieved. There was, however, some oozing of blood between the tooth and the gum, and on June 27, when the patient was seen by the writer, there was oozing from the gum in this region and elsewhere to a slight extent. There were also numerous minute hemorrhagic puncta in groups scattered over the skin of the body, particularly on the lower part of the legs. The general condition of the patient, however, was excellent. She had been up and about until this time, when she was put to bed. The spleen, which previously had not been palpable, was now distinctly felt 7 cm. below the costal margin, and extended almost to the median line. On pricking the lobe of the ear to make a blood count, the blood was a peculiar dark color and of watery consistency; it showed little tendency to clot. The white count was 24,600 and the red count 3,770,000. Urine: specific gravity 1.025, trace of albumin, few casts and polymorphonuclear leucocytes. Although the patient still felt perfectly well and the general condition was good, it seemed probable that there was a sudden recurrence of condition of the so-called hemorrhagic type of termination. Notwithstanding the probability that another series of radium treatment would avail little in such a crisis,

TABLE SHOWING TOTAL NUMBER OF RED AND WHITE BLOOD-CELLS AND PERCENTAGE OF HEMOGLOBIN.

Date	Red Cells	White Cells	Hemoglobin Per Cent.
April 13, '15	3,750,000	280,000	62
“ 20	3,680,000	286,000	60
May 1	3,650,000	290,000	60
“ 20	3,600,000	292,000	60
“ 30	3,620,000	310,000	59
June 10	3,640,000	360,000	61
“ 22	3,560,000	392,000	60
July 1	3,680,000	440,000	60
“ 8	3,690,000	480,000	60
“ 27	3,890,000	431,600	62
Aug. 4	3,320,000	442,000	61
“ 19	3,180,000	462,000	59
Sept. 10	3,090,000	460,000	58
“ 23	2,912,000	460,000	58
“ 30	2,850,000	450,000	58
Oct. 11	2,510,000	432,000	54
“ 25	2,230,000	496,000	50
Nov. 2	2,750,000	470,000	50
“ 3	2,800,000	467,000	49
“ 4	2,810,000	445,000	50
“ 6	2,790,000	495,000	50
“ 9	2,930,000	446,000	50
“ 13	2,910,000	430,000	51
“ 16	3,090,000	406,000	54
“ 18	2,900,000	325,000	52
“ 20	2,980,000	264,000	54
“ 23	3,180,000	258,000	55
“ 27	3,020,000	256,000	59
“ 30	3,370,000	220,000	68
Dec. 3	3,800,000	286,000	72
“ 6	3,750,000	282,000	70
“ 10	3,680,000	332,000	69
“ 15	3,300,000	274,000	69
“ 19	3,620,000	159,000	76
“ 21	3,640,000	158,000	74
“ 24	3,700,000	110,000	74
“ 28	3,720,000	72,000	75
“ 31	3,740,000	73,600	75
Jan. 4, '16	3,760,000	74,000	75
“ 14	3,900,000	63,000	78
“ 21	3,880,000	75,000	78
“ 28	4,020,000	74,000	81
“ 31	4,120,000	28,000	84
Feb. 5	4,090,000	17,600	83
“ 8	4,100,000	17,800	84
“ 11	4,180,000	14,920	85
“ 16	4,240,000	13,800	87
“ 22	4,380,000	14,400	88
Mar. 1	4,670,000	13,000	89
“ 27	4,660,000	7,200	89
April 15	4,800,000	5,800	90
May 15	4,600,000	8,000	—
June 15	4,580,000	6,040	90
“ 27	3,770,000	24,600	—

Fig. 11. Table showing the total number of red and white blood cells and the per cent. of hemoglobin.

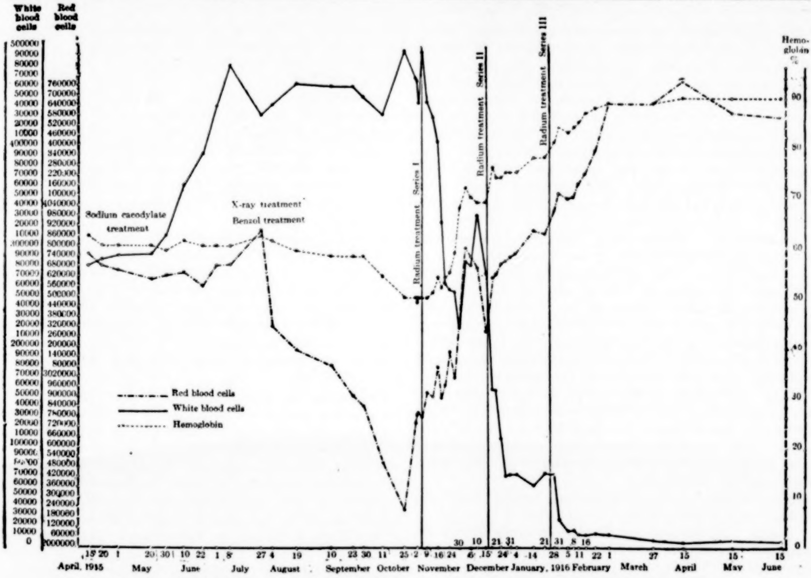

Fig. 12. Chart showing the total number of red and white cells and the per cent. of hemoglobin.

the patient was admitted to the Albany Hospital on July 1, and the fourth series of radium treatments was given by Dr. T. F. Doescher, with the same technic as in previous series. The bleeding from the gums had become general; there had been an abundant hemorrhage from the nose, which was controlled only by packing. The skin was covered with numerous ecchymoses, discrete and in "blotchy" areas. There was continuous discharge of blood from the uterus. Bleeding continued in spite of the administration of horse serum. On July 4, the patient complained of a very severe headache, which was different from headaches to which she had been subject for years. She finally fell asleep and could not be aroused, she had numerous generalized convulsions, the pulse became weaker, and the patient died on July 5.

Blood Examination.

COMPARISON OF TOTAL NUMBER OF WHITE CELLS AND RED CELLS AND OF THE PER CENT. OF HEMOGLOBIN BEFORE, DURING, AND FOLLOWING TREATMENT.

From April to June, 1915, the white cells varied from about 300,000 to 450,000, the red cells from 3,800,000 to 3,600,000, and the hemoglobin remained about 60%. During this time, therefore, the sodium cacodylate treatment above referred to produced no marked effect.

From July to November, 1915, the white cells increased to 500,000, the red cells for a few weeks gradually increased to 3,900,000, and then decreased markedly during August and September to 2,200,000, and the hemoglobin diminished to 50%. During the early part of this period the x-ray was begun, and later, because there was no apparent beneficial influence from the x-ray, it was combined with benzol treatment. Shortly after the use of benzol, the marked reduction in the red cells, and the hemoglobin above mentioned, occurred, while the number of white cells was not diminished. Because of this, and from the fact that there were definite toxic symptoms (see above), benzol treatment was omitted, and although x-ray was continued for a short time, there was no apparent change in the white cells or hemoglobin. The first series of radium treatment was followed by a fall in the white cells from 495,000 to 159,000, a rise in the red cells from 2,790,000 to 3,620,000, and the hemoglobin from 50% to 76%. After the second series of radium treatments, the white cells fell to 74,000, the red cells and hemoglobin rose to 4,020,000 and 81% respectively. After the third series of radium treatments, the white cells fell to 5800, the hemoglobin rose to 90%, and the red cells to 4,800,000. The blood, numerically, remained normal for somewhat over three months, when there was a sudden, rapid increase in the size of the spleen, multiple hemorrhages in the skin and mucous membranes, and the white count rose to 24,600, and the red cells decreased to 3,770,000. The record of the number of red and white cells, and the percentage of hemoglobin is shown in tabular form in Fig. 11 and charted in Fig. 12.

COMPARISON OF THE RELATIVE AND ABSOLUTE NUMBER OF WHITE BLOOD CELLS.

Blood smears made upon slides were stained by both Wright's and Giemsa stains. In making the differential counts the following simplified classification was adopted for the purpose of clearness:

Myelocyte. The term myelocyte was used to include typical myelocytes with characteristic granules. The larger, non-granular myeloblasts, many of which, morphologically, it is difficult to distinguish from the large mononuclear leucocytes and cells transitional between these two forms, or premyelocytes, were included under the general term, myelocytes. Neutrophilic, basophilic and eosinophilic myelocytes were not counted separately.

Polymorphonuclear Leucocytes. With the polymorphonuclear leucocytes were also included the immature forms, some with granules and occasionally bi-lobed nuclei, the so-called metamyelocytes.

Eosinophil. Under the heading eosinophils, slightly immature forms were considered.

Lymphocyte. No differentiation between large and small lymphocytes was made.

During the early months of the study of this case no attempt was made to differentiate morphologically between certain myeloblasts and large mononuclear leucocytes. Indeed, this would seem very difficult, even with the aid of the oxidase reaction. In the latter part of the study, however, when all the myelocytes had disappeared following treatment, the term "large mononuclear leucocyte" was used. The so-called transitional and endothelial cells have been regarded as synonymous with large mononuclear leucocytes.

Mast Cells. Only typical mast cells were included under this term.

Blasts. While making the differential counts an attempt was made to distinguish normoblasts, the intermediate forms, and megaloblasts.

Following the radium treatment above described, the relative number of polymorphonuclear leucocytes increased from about 60% to 78%, and then diminished to 50%, whereas the absolute number fell from 299,475 to 2917. The relative number of lymphocytes rose from 2.3% to 45.7%. The absolute number of lymphocytes fell from 11,750 to 2650. The relative number of myelocytes fell from 36% to zero, and the absolute number of myelocytes fell from 178,200 to zero. There was little change in eosinophils, the relative number diminishing from 1.2% to .3%. The increase in the large mononuclear leucocytes from zero to 3.1% is in part only apparent for the reasons above described. Mast cells increased from zero to 4.3% and later diminished to .6%. The blasts, which were present as normoblasts, intermediate forms and megaloblasts, from 3 to 6 in counting between 500 and 600 cells, entirely disappeared. The records of the comparison of the relative and absolute number of white cells are tabulated in Fig. 13 and charted in Fig. 14.

Morphological Appearance. Blood smears at the beginning of radium treatment were typical of myelogenous leukemia (see Fig. 15), showing large numbers of myeloblasts and myelocytes. The white count was 495,000, the polymorphonuclear leucocytes relative number 60.5%, absolute number 299,475, myelocytes relative number was 36%, absolute number 178,200.

During radium treatment the myelocytes diminished rapidly, the blood smears showing an apparent increase in polymorphonuclear leucocytes and a marked diminution in myelocytes (see Fig. 16). The total white count was 159,000, the relative number of polymorphonuclear leucocytes 65.3%, and the absolute number was 103,827. Relative number of myelocytes was 28% and the absolute number 44,520.

Following the three series of radium treatments, the relative and absolute numbers of white and red cells and the per cent. of hemoglobin were normal, and all abnormal white cells had disappeared. The red cells, however, even at the height of the patient's improvement, continued to show considerable variation in size and shape (see Fig. 17).

Uric Acid in the Blood. Chemical examination of the blood obtained on November 5, 1915, the day before the radium treatment, showed 3.78 milligrams per 100 cc. of blood. Similar examination made of blood obtained November 27, 1915, three weeks after the treatment by radium had been commenced, showed 2.48 milligrams per 100 cc. of blood. A third examination of blood obtained on March 3, 1916, about five weeks after radium treatment had been concluded, showed 3.5 milligrams of uric acid per 100 cc. of blood. From the above it is evident that there is little change in the uric acid in the blood compared with the increase in the uric acid in the urine. (See below.)

*Chemical Examination of the Urine.** Patient was put on a purin-free diet before, during, and for considerable periods after each series of radium

TABLE SHOWING COMPARISON OF RELATIVE AND ABSOLUTE NUMBER OF WHITE BLOOD CELLS.

Date	Polym.		Lymphoc.		Myeloc.		Eosin.	Large Mono.	Mast C.	No. Cells Counted	Number Blasts Seen N–I–M
	(Rel.)	(Abs.)	(Rel.)	(Abs.)	(Rel.)	(Abs.)	(Rel.)	(Rel.)	(Rel.)		
April 13, '15	55.6	155,680	2.4	6,720	40.1	112.280	1.9	0	0	636	7–1–0
July 26	60.1	259,391	1.7	7,337	36.1	155,807	2.1	0	0	664	4–0–2
Sept. 23	60.8	279,680	1.4	6,440	35.8	164,680	2.0	0	0	500	2–1–0
Nov. 2	59.4	279.180	2.5	11,750	36.5	171,550	1.6	0	0	636	2–0–1
" 6	60.5	299,475	2.3	11,385	36.0	178,200	1.2	0	0	795	4–1–0
" 9	62.2	277,412	3.7	16,502	33.4	148,964	.7	0	0	539	2–1–0
" 13	67.2	274,960	1.8	7,740	29.5	126,650	1.1	0.3	0.1	669	0–0–0
" 16	57.5	233,450	2.9	11,774	38.3	155,498	1.3	0	0	611	6–0–1
" 23	62.9	162,282	2.4	6,192	28.0	72,240	2.4	0	4.3	332	4–0–0
Dec. 3	73.2	209,352	2.5	7,150	21.5	61,490	1.0	0.7	1.1	719	3–0–0
" 20	65.3	103,827	4.6	7,314	28.0	44,520	1.1	0	1.0	694	3–0–2
Jan. 4, '16	64.3	47,582	17.4	12,876	12.5	9,250	1.0	1.7	3.1	478	0
Feb. 5	78.6	13,833	15.2	2,675	1.3	982	0.1	4.6	0.2	785	0
Mar. 7	65.6	8,528	29.6	3,848	0.3	39	0.7	3.8	0	287	0
" 27	51.4	3,700	44.7	3,218	0	0	1.2	2.6	0.1	535	0
April 15	50.3	2,917	45.7	2,650	0	0	0.3	3.1	0.6	322	0

Fig. 13. Table showing comparison of the relative and absolute number of white cells.

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* I am indebted to Dr. Arthur Knudson, Professor of biological chemistry, Albany Medical College, under whose direction the chemical examination of the urine was made, in association with Mr. Theodore Erdos. A detailed report of the urine examination will be the subject of a separate article by Professor Knudson and Mr. Erdos.

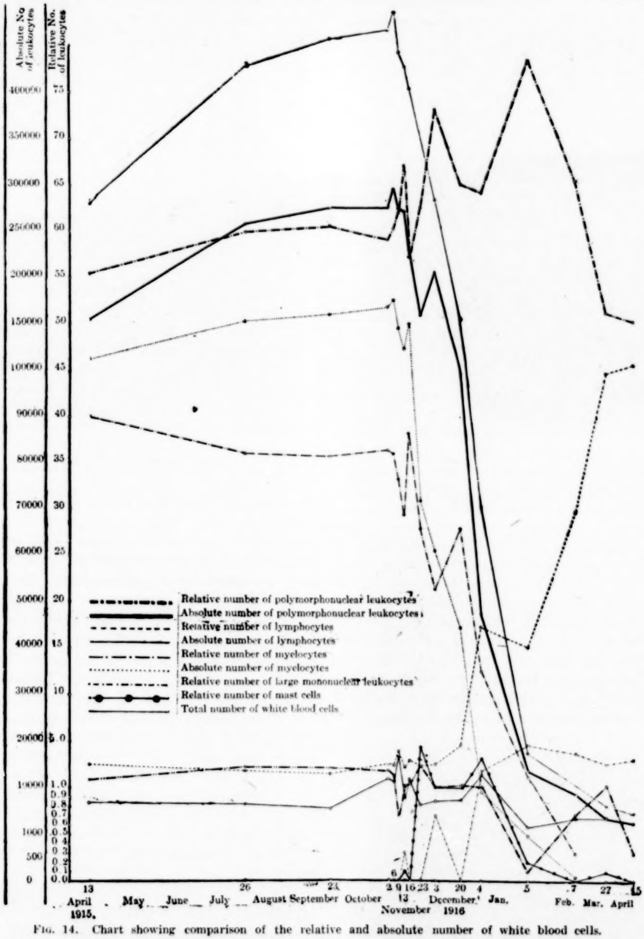

FIG. 14. Chart showing comparison of the relative and absolute number of white blood cells.

treatment. After the first series of radium treatment, the total nitrogen, urea nitrogen, and ammonia nitrogen excretion began to increase immediately, and at the end of seven days the excretion reached a maximum, and was more than double. After the seventh day, there was slight decrease, and then remained more or less constant. The uric acid output showed a slight increase for the first seven days and then remained about the same, with several wide variations. The elimination of total phosphates showed most remarkable result. The phosphates increased immediately after the first day of treatment. At the end of the seventh day the excretion had been triple. There was then a gradual fall until the next series of radium treatments. The fall in excretion of phosphates did not reach normal, but remained about twice normal.

After the second series of radium treatments, the total nitrogen, urea nitrogen, ammonia nitrogen and uric acid showed a similar increase in excretion for six or seven days. The phosphate excretion likewise increased.

After the third series of radium treatments, the increased excretion of the various substances mentioned was similar. It is interesting to note that after all three series of radium treatments, the increase in excretion continued for about six or seven days after the beginning of treatment and then dropped. The phosphates elimination showed the greatest increase.

Summary. Results similar to those above described in the treatment of leukemia have been reported by various observers who have used the

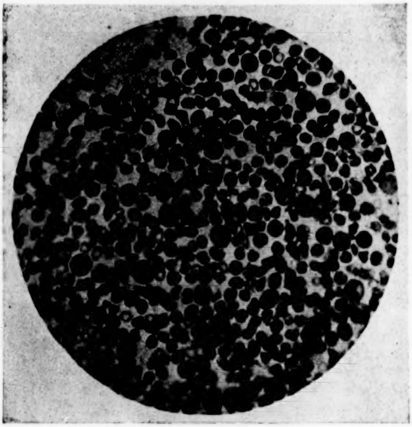

Fig. 15. Photo-micrograph of blood smear November 6, 1915, showing large numbers of myeloblasts and myelocytes. The white count was 495,000, the polymorphonuclear leucocytes' relative number was 60.5%, absolute, 299,475; myelocytes' relative number was 36%, and the absolute number, 178,200.

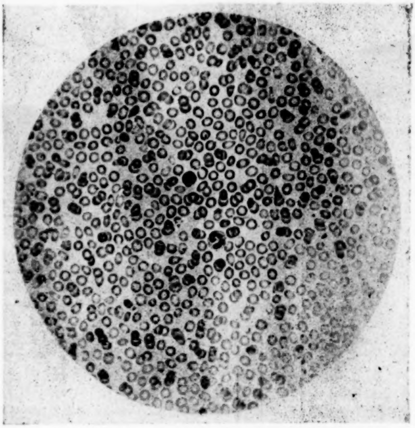

Fig. 17. Photomicrograph of blood smear March 27, 1916. Total number of white cells, 7,200, relative number of polymorphonuclear leucocytes, 51.4%, absolute number, 3,700; myelocytes, relative number, none, absolute number, none. Red cells show considerable variation in size and shape.

x-ray for treatment, particularly when similar methods were used and the applications made over the enlarged spleen. In the majority of cases, however, the long bones have also been rayed. It is to be noted that in the surface applications of radium the results were obtained without radiating the long bones; in fact, in a case in which the long bones were radiated there was apparently an increase rather than a diminution in the white cells. It is also believed that the results are more prompt by the radium treatment than by the x-ray as usually employed and no case has been accompanied by toxic symptoms, although there is a marked increase in the endogenous purin metabolism. On a purin-free diet, uric acid, urea, total nitrogen, phosphates and acidity of the urine are remarkably increased by radiation. Because of this it is advisable to have a careful examination of the urine before treatment is begun and to place the patient during and after treatment on a purin-free diet. The recent developments in the x-ray by Coolidge and his co-workers and the resulting accurate standardization of the dosage, and the increased intensity and penetrating power make it probable that the results of x-ray treatment will be equally as good as those obtained by radium.

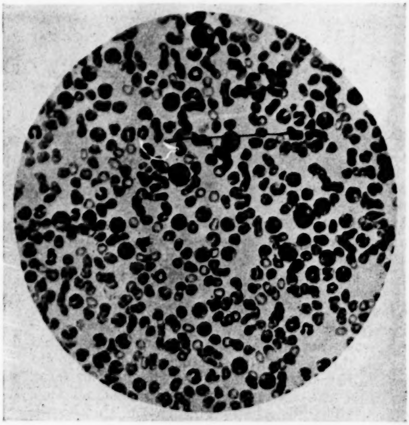

Fig. 16. Photo-micrograph of blood smear December 20, 1915, showing apparent increase in polymorphonuclear leucocytes and the marked diminution in myelocytes. The total white count was 159,000, relative number of polymorphonuclear leucocytes, 65.3%, and the absolute number, 103,827. Relative number of myelocytes was 28%, and the absolute number, 44,520.

Sixty milligrams of radium or millicuries of emanation used by the technic above described would seem most satisfactory. Twenty-five milligrams of radium element, however, have produced similar results although the number of applications was greater and the response much more gradual. In the case above detailed only three series of applications were necessary before the blood returned to normal. In other instances with less perfected technic six or more series have frequently been necessary.

Many of the cases which responded promptly to radium applications over the spleen had previously proved refractory to x-ray and benzol treatment. Although the results in the radium treatment of leukemia are most striking in the chronic myelogenous variety in certain cases of lymphatic leukemia, the effects are almost equally as good. In the acute, fulminating leukemias radium treatment is of no value. In some cases of chronic myelogenous leukemia, however, even when the general condition is very poor at the start, there may be marked temporary improvement. It must be understood, however, that the results should be regarded at the present time merely in the light of palliation and not as a cure. It is hoped, however, that future research will at least increase the duration of these remissions. It is suggested that the spleen be removed during the period of most marked improvement, at the height of a remission when the spleen is of normal size and the general condition of the patient excellent. Although the treatment must not be considered at the present time as curative, from the results obtained it is the best form of treatment now at our disposal.

The remissions last from months to years. In the case above detailed there was a remission of from six to eight months during which the patient was entirely free from symptoms of the disease. In other instances, remissions have lasted from two to three years, although there is always a tendency for the disease to relapse, and each recurrence responds less promptly and less completely to radium treatment. During the remissions, patients may feel entirely well and assume the usual duties connected with their work and social affairs. They are, however, very susceptible to intercurrent infections. A case of fatal pneumonia occurred at the height of the improvement in the remission. Rapid recurrence and death by small gradual or massive hemorrhages or from weakness may occur after benzol and x-ray treatment and also, as in the case above described, after a remission produced by radium. Indeed, such rapid termination is common in untreated cases.

Conclusions. I. Surface applications of radium in leukemia produce striking, indeed remarkable, improvement in (a) the blood picture which becomes almost normal, (b) in the size of the spleen and glands, which are reduced almost to normal, (c) in the general condition of the patient who from an emaciated and weak condition may become plump and strong. II. The duration of remission is variable, it may last from months to years. III. The results of radium treatment are *not* regarded as *curative*. It is believed to be, however, the safest as well as the most prompt palliative measure in cases of chronic leukemia whether *refractory* or not to benzol or x-ray treatment. From the results of radium therapy in leukemia it is believed to be the best form of treatment now at our disposal.

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A METABOLISM STUDY OF A CASE OF LEUKEMIA DURING RADIUM TREATMENT.*

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IN conjunction with a careful clinical study of a case of myelogenous leukemia treated by surface application of radium it was thought it might be of especial interest to study the metabolic output in the urine of the patient. In the literature there are numerous reports of the metabolism in leukemia cases, some without treatment, some during various treatments, among them the action of x-rays, but none, as far as the authors know, of the study of a case treated by surface application of radium.

Von Moraczewski[1] in a study of a case of chronic leukemia, concluded that leukemia is a nitrogen and phosphorus disease and found that almost all constituents, especially phosphorus and nitrogen, in the food, were retained abnormally, because of a lack of katabolism.

In "splenomedullary leucocythemia" Milroy and Malcolm[2] likewise observed an absolute diminution of phosphorus excretion. These observers also noted that the proportion of alloxuric nitrogen (uric acid and bases) to total nitrogen was increased. Later[3] in "lymphatic leucocythemia" they found a marked diminution in the absolute amount of phosphorus excreted. In this case which they studied the uric acid and bases were hardly affected. In a case of "medullary leucocythemia," where the number of leucocytes was rapidly falling, the phosphorus excretion was found to have undergone no diminution, while the uric acid and the bases were diminished. White and Hopkins[4] observed no relation between leucocytosis and the excretion of the products such as phosphorus and alloxuric bodies which result from katabolism of nuclein.

In complete balance experiments with cases of lymphatic and myelogenous leukemia Stejskal and Erben[5] found in one chronic lymphatic case a marked nitrogen retention, indicating, according to them, diminished power of oxidation. In the case of myelogenous leukemia there was a slight retention of the nitrogen and phosphorus. Y. Henderson and Edwards[6] in a case of lymphatic leukemia which they studied over a long period (6½ months), found that, notwithstanding, an enormous leucocytosis (175,000-380,000 per cu. mm., of 96% lymphocytes) and in spite of alternation of periods of great increase and marked diminution in the number of circulating corpuscles, the excretion of phosphorus and uric acid was at no time excessive. They believe leucocytosis to be due not to general increase in nuclein metabolism but to failure in normal destructive metabolism. In the course of their study they observed two periods; in the first, nitrogen was subnormal, uric acid slightly above normal, and phosphorus distinctly subnormal; in the second period there was a distinct diminution of nitrogen, an increase of uric acid, and a further great reduction in phosphorus.

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* Clinical study of this case is reported by Dr. Thomas Ordway in a separate article.

Henderson and Edwards, by the changes in the amount and the proportion of urinary constituents during their own much more protracted observations, harmonize the conflicting observations of Milroy and Malcolm, Von Moraczewski, and White and Hopkins by showing that their apparent differences are probably due to the fact that these experimenters made their observations at different stages in the progress of the disease.

Symmers[7] found the excretion of organic phosphorus in the urine pronounced in lymphatic leukemia.

In a case of myeloid leukemia treated by Roentgen rays Lossen and Morawitz[8] found that the volume of urine was diminished, that the total nitrogen, uric acid and phosphorus excretions were lowered, and that the number of leucocytes was diminished (350,000-212,000). On continued treatment the uric acid content decreased, the nitrogen elimination remained the same and the phosphorus content increased. Königer[9] in myeloid leukemia under the influence of Roentgen rays found that the uric acid excretion increases parallel with the retraction of the spleen and the breaking up of the leucocytes, and that the uric acid excretion is a positive measure of cell breakage, but not an index to the extent of the cell destruction. Ammonia and phosphates show at times an increase generally parallel with nitrogen increase and also with the betterment in the leukemic symptoms.

In a metabolism study of leukemia under the influence of Roentgen rays, Musser and Edsall[10] found that the phosphorus metabolism is of particular interest. In conditions where leukemia symptoms are progressing, there is a constant construction of tissues that are rich in phosphorus and, hence, they believe there will be a retention, and since leukemia tissues contain large amounts of phosphorus the retention is relatively large. The excretion of nuclein products of disintegration of uric acid, purin bases, and phosphates is likely to be high, due to a large amount of nucleins in leukemia tissue. By the influence of Roentgen rays in three-day periods the nitrogen excretion increased about 70%, the uric acid about 60%, the purin bases about 260% and the phosphates about 200%. The authors explain this action of Roentgen rays as due to accelerating autolysis.

EXPERIMENTAL.

Since the clinical aspects of this case are discussed in a separate paper by Dr. Ordway, no description of it is needed here other than to say that the patient was a woman, 30 years old, suffering from myelogenous leukemia. The spleen was greatly enlarged and the white count was 495,000 at the beginning of radium treatment.

The treatment consisted, briefly, in applying 50-60 millicuries of radium emanation (50-60 mg. of radium element) to small areas on the abdomen, which was marked off, indicating the outlines of the enlarged spleen. Each area was rayed for four hours during the first series and six hours during the second and third series of treatments. Each series of treatments required three to four days to cover the surface over the area of the enlarged spleen. Between each series of treatments about four to six weeks were allowed to intervene, the time being determined by the examination of the blood.

No attempt was made carefully to regulate the diet, although a record of food taken was kept and found to vary within narrow limits. The diet was practically purin free during and following the series of treatments. It consisted chiefly of bread, cereal, potatoes, milk, butter, eggs, fruit, and, occasionally, beef, chicken, and a few vegetables.

The urine was collected for 24-hour periods in thymolized bottles and brought to the laboratory for analysis immediately after the 24-hour period was up. At the beginning of the first series of treatments the urine was collected daily from November 6 to 13, inclusive, and after that date it was collected on an average of three times a week except during two periods of a week each when it was discarded because of menstruation.

Total nitrogen was estimated by the modified Kjeldahl method, urea by the urease method, ammonia by Folin's method, uric acid by Benedict's modification of Folin's colorimetric method, creatinin by Folin's method, phosphoric acid by titration with uranim acetate, and the acidity by Folin's method. The urine was at all times during the treatment free from albumen and sugar.

The results of the observations during and following the three series of radium treatments are given in the accompanying table with a report of the white and red blood count taken from Dr. Ordway's paper. Unfortunately, we were unable to obtain the urine several days before the series of treatments began so as to have a preliminary period to compare with the action of radium. However, the first day's sample of urine was partly collected during no radium treatment, as treatment was not begun until 6 p. m. and most likely radium had little effect in that sample of urine, the period of which was up at 8 a. m. the next morning. Also, in taking into consideration the results of a number of investigators, it is noted that the period during no effective treatment or increase in leukemia symptoms is characterized by re-

TABLE OF URINARY ANALYSES AND BLOOD COUNT

Date	Volume	Sp Gr	Total N	Urea N	Ammonia N	Creatinine N	Uric Acid N	Total Acidity N/10 HCl	Total Phosphates P₂O₅	Red blood cells	White blood cells
1915	c.c.		gm	gm.	gm	gm	gm	c.c.	gm		
Nov 6	First	series of	Radium	Treatments							
	802	1.017	5.440	3.184	0.265	0.333	0.078	174.	0.724	2 790 000	495000
7	810	1.017	5.530	4.440	0.344	0.346	0.095	251.	0.803		
8	900	1.017	6.280	4.549	0.376	0.381	0.187	256.	0.847		
9	1030	1.016	7.054	5.373	0.405	0.319	0.189	334.	1.086	2 930 000	446 000
10	1053	1.018	6.906	5.438	0.316	0.310	0.193	354.	1.175		
11	1090	1.018	10.190	8.492	0.577	0.352	0.211	403.	1.66		
12	1210	1.017	11.890	9.045	0.674	0.413	0.229	600.	1.96		
13	1057	1.017	9.375	7.094	0.594	0.307	0.168	413.	1.486	2 910 000	430000
16	1040	1.014	8.508	5.325	0.728	0.305	0.206	330.	1.118	3 090 000	406000
18	1060	1.014	8.324	6.690	0.811	0.356	0.224	389	1.134	2 900 000	325000
20	1088	1.012	6.276	5.118	0.584	0.341	0.158	256	1.352	2 980 000	269000
22	1500	1.01	7.085	6.311	0.480	0.435	0.294	247	1.461		
27	1200	1.015	7.537	6.093	0.51	0.379	0.282	367	1.2	3 020000	
Dec 8	920	1.016	8.528	6.428	0.698	0.364	0.183	383	1.152		
10	1175	1.016	9.220	7.633	0.698	0.309	0.243	358	1.21	3 680000	332 000
18	Second	series	of	Radium	Treatments.						
24	800	1.02	9.177	5.539	0.553	0.339	0.247	379	1.886	3 700 000	110 000
28	1275	1.016	10.941	9.509	0.668	0.439	0.262	475	3.89	3 720000	72 000
Jan 4	1125	1.019	10.570	8.372	0.545	0.448	0.227	467	2.02	3 760000	74 000
10	800	1.023	6.490	4.821	0.495	0.345	0.177	286	1.943		
12	950	1.022	7.626	4.852	0.418	0.377	0.182	256	1.215		
14	1040	1.018	6.938	5.194	0.427	0.411	0.196	289	1.920	3 900000	630000
17	900	1.025	8.256	6.184	0.385	0.406	0.299	292	1.323		
19	940	1.018	7.343	5.609	0.480	0.425	0.251	237	1.276		
22	1410	1.017	9.093	7.546	0.369	0.388	0.296		3.854		
26	1135	1.023	11.045	9.579	0.476	0.399	0.289	416	2.032		
27	Third	series	of	Radium	Treatments.						
Feb 2	1000	1.02	9.930	8.338	0.605	0.326	0.161	350	2.604		
4	1220	1.021	11.450	9.774	0.694	0.437	0.169	448	3.35		
8	1020	1.024	10.320	8.669	0.206	0.430	0.216	416	2.134	4100000	17800
10	1120	1.022	8.862			0.396	0.229		1.490		
12	1190	1.008	8.332				0.186		2.048		
17	1175	1.024	10.754	7.776	0.420	0.442	0.173	331	2.241		
19	1100	1.022	9.362	8.008	0.461	0.466	0.181	289	1.684		
22	1087	1.025	12.219				0.195	430	2.103	4380000	14 400
29	1100	1.024	11.860	9.317	1.532	0.419	0.281	434	2.363		
Mar 3	1210	1.024	12.439			0.404	0.294	320	1.947		

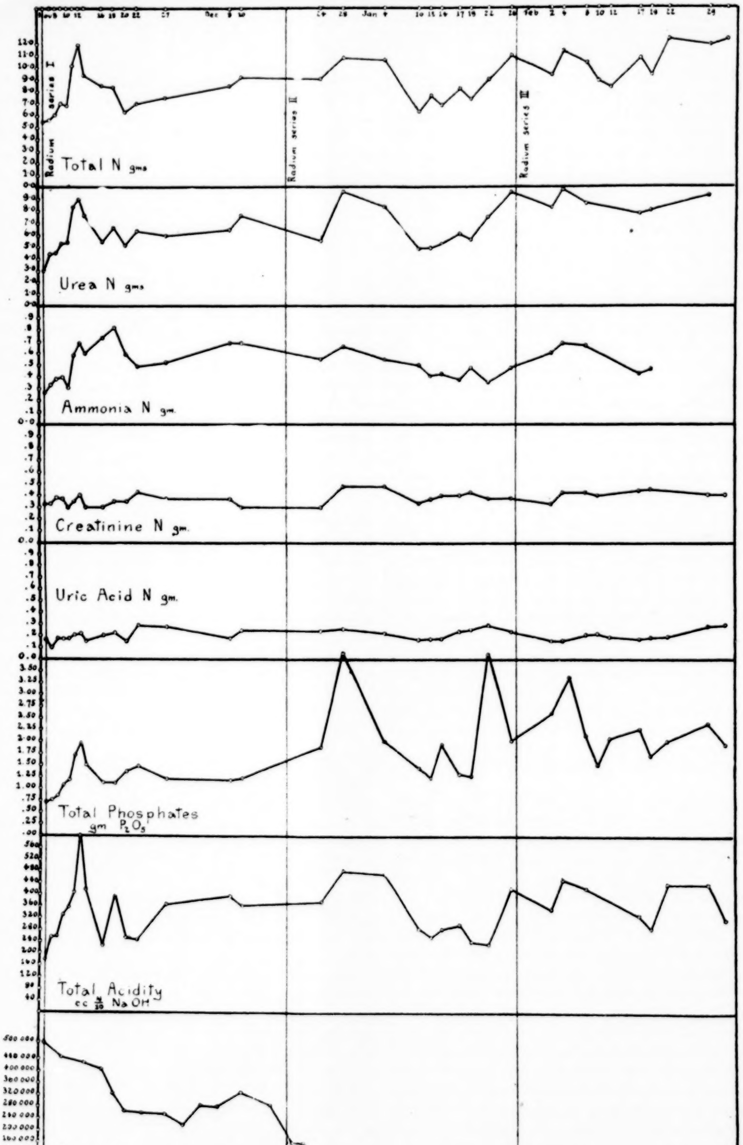
tention of nitrogen, phosphoric acid and uric acid.

Examining the table of analyses it is noted that the volume of urine increased 50% in the first seven days from the beginning of treatment. The total nitrogen, urea nitrogen, and ammonia nitrogen excretions likewise showed remarkable increases in the first seven days. The total nitrogen increased about 115%, urea nitrogen 140%, and ammonia nitrogen 150%. The uric acid nitrogen increased less than any of the other nitrogen excretions, only about 28%. We would expect the uric acid to increase considerably more since the tissue which is disintegrated is rich in nuclein material and should be among the products of disintegration. It may be that the uric acid is broken down further, due to radium having a disintegrating action on uric acid as it does in vitro. According to Sarvonat[11], radium emanation decomposes uric acid; oxalic acid is found among the products of decomposition. Another theory why uric acid may not be increased so much is that of Gudzent and Lowenthal[12]. They found that radium emanation has a pronounced influence on purin metabolism. The action being due to activation of those ferments which are responsible for building up or for cleavage of uric acid according to which ferment action predominates. In the above instance in which we would expect the uric acid to increase considerably it may be possible that the cleavage ferment is activated and in which case it would break up the uric acid.

Coincident with the increase of the nitrogen constituents, the total acidity and phosphates show a very decided increase; the former is increased by about 235% and the latter 174%. The total acidity was parallel, to a certain extent, with the excretion of the total phosphates.

After the seventh day of the first series of treatments all of the excretory products show a slight drop. However, these excretory products, in spite of this drop, are at a higher level at the time of the next series of treatments than at the beginning of the first series.

Charts showing results of Urinary Analyses and Blood Count.



In the second series of treatments which began December 18 we were unfortunate in not getting any samples of urine for several days on account of the menstrual period. However, it seems that the same effect occurs as in the first series—an increased excretion. The total phosphates reaching in this series on the tenth day an increase of 445% over the excretion for the first day of the experiment. The high level of excretion seems to occur about the tenth day compared to the seventh day in the first series. There is in this series a slight drop in the excretions after the tenth day and then later a rise so that at the beginning of the third series of treatments the excretions are again at a higher level. It may be that the radium action is still effective at this date or that there is very little or no retention of products at this stage of the disease.

The third series of treatments began January 27. Since excretions were high just before the treatment began there does not appear a decided increase in any of the constituents except the phosphates on the eighth day after the beginning of the third series.

It is interesting to note in the first series of radium treatment that the increase in the excretory products in the urine begins immediately and reaches a maximum in about seven days while the drop in white blood count is more gradual in that time. The greatest drop in the number of leucocytes occurred between the twelfth to fifteenth day after treatment.

It is also very striking that throughout the series of treatments the uric acid excretion is not excessive at any time, which might be expected to run more or less parallel with phosphorus excretion.

The charts showing the results of the urinary analyses and blood count also aid in showing the changes brought about by the radium treatment and are more or less self-explanatory.

CONCLUSIONS.

The excretions of total nitrogen, urea, ammonia and phosphates are enormously increased immediately after the action of radium.

The uric acid output is only slightly increased compared to the other nitrogenous constituents.

Surface applications of radium over the spleen accelerates the disintegration of nuclein tissue, resulting in the above increases. The uric acid which would be expected to be formed by disintegration of nuclein is probably broken up further so that it is not increased.

The phosphates show the most remarkable results, increasing as high as 400%, at times, over the excretions at the beginning of treatment.

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Book Reviews.

A Reference Hand Book of the Medical Sciences. Third edition, completely revised and rewritten. Edited by THOMAS LATHROP STEDMAN, A.M., M.D., complete in 8 volumes. Volume VII. New York: Wm. Wood & Company. 1917.

This seventh volume of the third edition of the familiar handbook originally edited by Dr. Albert H. Buck and embracing the entire range of scientific and practical medicine and allied science, includes the subjects alphabetically from Pacchioni to Storax. It is the work of over one hundred contributors, including many familiar names of distinction in the United States and Canada. The volume is well illustrated with numerous chromo-lithographs and with 469 half tones and wood engravings. The series to which it belongs is a valuable adjunct as a work of reference in the library of every physician.

Care of Patients Undergoing Gynecologic and Abdominal Procedures, Before, During and After Operation. By E. E. MONTGOMERY, A.M., M.D., LL.D., F.A.C.S. Illustrated. Philadelphia and London: W. B. Saunders Company. 1916.

The little book gives to the intern an excellent view of some gynecological procedures. It is especially to be recommended to the novice to whom, at the beginning of his work in the hospital, everything is "unusual." It helps him to find himself and his place more quickly, particularly in hospitals where the house-officer is expected to absorb information and grow in knowledge without much instruction from his superiors. It is clear, compact and sound.

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ADEQUATE MEDICAL PREPAREDNESS.

No plan of national preparedness is at all complete without provisions for adequate medical service. The European war has clearly demonstrated the important part the medical unit plays in military campaigns. In the few wars in which this country has engaged, probably the most glaring defect was the inadequacy of its medical services. Many of the preventable casualties can be placed at the door of this condition. The notion that, at least in regard to the medical needs, they could be supplied on demand, fully prepared to take up this work, is now everywhere admitted to be erroneous. Not even the highest amount of medical skill qualifies one of itself to do duty efficiently as a military medical officer. Without special military training, the medical man is little better than useless, except in purely technical work away from the field. In time of action the capacity of the fighting forces is influenced largely by the number of the disabled who are rendered fit to return to the field in the shortest possible time or who, despite their disability, can be converted to other military needs; but more especially the ability of the medical branch to prevent the spread of epidemic and to control disease among the forces concentrated in the field or barrack. The general maintenance of the health of the military forces is of the highest importance, and much more than the comparatively minor individual medical work done. But any successful sanitary work calls for organization and coöperation of the highest order. In this regard the problems presented in military life are entirely new—and probably as new to the medical man as to the layman. The medical man must have the proper special military training if he is to be of more value than the layman.

Moreover, it must be remembered that the casualties in the ranks of the medical man are as large as those of other officers, and probably as large in proportion as those of the enlisted man. The medical man who enters the military organization during active service must be prepared to make the same sacrifices and undergo the same hardships as the rest of the forces.

In the *Military Surgeon* of February, 1917, Captain Mahlon Ashford outlines "The Most Practical Plan for the Organization, Training and Utilization of the Medical Officers of the Medical Reserve Corps of the United States Army and Navy and of the Medical Officers of the Officers' Reserve Corps of the United States Army, in Peace and War." This article deserves careful consideration as the expression of an experienced medical officer, who is conversant with the needs of the medical services. Captain Ashford first calls attention to the necessity of enlisting the coöperation of the medical public to the need of medical preparedness through the medical press, the lay press, through lectures and through affiliations. The special medical talent of the civilian must be ascertained so that it can be fitted into the proper place when needed, with the least possible delay or confusion. That every medical man must be embraced in such a plan can be seen from the size of the medical army needed in war time. Seven medical officers to every thousand men is not large. It is estimated that, in an army of five million men, about thirty-five thousand medical officers would be required.

The technical medical work must needs be always left to the civilian expert, so that the regular military medical officer can be utilized for organization, training and administration.

In a permanent plan of this kind, it is contemplated to keep these ranks filled with trained men by beginning this training with the medical matriculant during his undergraduate courses, this special training being given by army, navy or reserve officers, designated through the departments. The medical school training will be as preparation for commissions in the reserve corps. Acceptance therein will, then, be without further examination, except for the physical. After the completion of the undergraduate work, supplementary training in military medicine, in preparation for higher reserve commissions, is to be carried out through a four-year correspondence course, with periodic field manoeuvres and examinations. Also, there is provision for postgraduate courses in advanced sanitary tactics.

Finally, no matter what plan of organization or utilization of the medical resources of the country is decided upon, it is necessary to have a comprehensive policy of preparedness so that an efficient and adequate medical body can be developed for use in emergency.

◆

RENEWED ACTIVITY IN THE CANCER CAMPAIGN.

THE American Society for the Control of Cancer has issued to all state medical associations a letter, stating that it was the unanimous opinion at the last meeting of the National Council that the professional organizations, particularly the state medical societies, should take the lead in a campaign for promoting familiarity with the most recent information about cancer and its treatment. The following suggestions for definite measures were made:

1. The American Society for the Control of Cancer renews its recommendation that your state medical association appoint a standing committee on cancer, if such action has not already been taken.
2. In order to obtain the best results, we believe that such committee should be continued in office for a term of at least three to five years. The conspicuous usefulness of the Cancer Commission of the Pennsylvania State Medical Society has, doubtless, been in large part due to the fact that there have been few or no changes in its membership and no changes in its chairmanship since its original appointment in 1909.
3. The chief function of such committees being the cancer education of the physician, we suggest that they follow the example of the Pennsylvania committee, in constantly stimulating up-to-date consideration of the cancer problem within professional circles. The cancer committee should, therefore, seek to promote addresses and symposia at state, district, and county society meetings, and should arrange for the publication of the best obtainable papers in the state journal, and the distribution of reprints and other approved literature among practitioners, including, especially, those who are not members of county societies.
4. The council directs me in particular to bring to your attention the report of our committee on "Free Tumor Diagnosis as a Function of State Public Health Laboratories." A copy of this report is being sent to you under other cover, and your attention is respectfully directed to the recommendations of the committee, on page ten. This report has been endorsed by the National Council, with an earnest recommendation that state medical societies take any action which seems to them appropriate, in obtaining the extension of public facilities for tumor diagnosis within their jurisdiction, both as a means of assisting the physician to a prompt and certain determination of doubtful cases, and at the same time of giving the patient the benefit of earlier and more promising treatment.
5. It is believed that the organized medical profession, through the agency of the state and county societies and special cancer committees, should also seek to promote the special instruction of nurses, social workers, and others coming in direct contact with patients, especially women, the object being that in no case should the nurse attempt to make a diagnosis, but that in all cases of suspicious symptoms, she should be prepared to advise immediate professional consultation, and follow up the matter with force and discretion until such result is obtained.

The report referred to in Article 4 of the foregoing, entitled "Free Tumor Diagnosis as a Function of State Public Health Laboratories," was writen by Leverett Dale Bristol and published in the *Journal of the American Medical Association*, May 27, 1916. The report is based on a survey of the various states in regard to the existing facilities for the laboratory examination of specimens of suspected cancerous tissue. After a study of the workings of the already established laboratories and a consideration of the arguments against the general establishment of free diagnosis of tumor tissue in state laboratories, the author concludes with the recommendations that: 1. So far as consistent with local conditions, facilities should be offered under public auspices in each state for the diagnosis of tissue suspected of being cancerous. 2. The logical place for the doing of such work is the laboratory of the state health department. It is not to be supposed that such work will be given the preference over other work now being done by these laboratories. 3. To cover this work, in those states which have no such facilities, additional money should be appropriated. 4. Judgment must always be used by surgeons in the removal of suspected cancerous tissue for diagnosis, and the value of a microscopic diagnosis should appear to outweigh the risk involved before such a procedure is adopted.

The Massachusetts Medical Society, as has been previously noted in the Journal, has already taken steps in accordance with those urged by the council.

Following investigation for some months past by a special committee, the society has recently approved the report and re-appointed the personnel of that committee as its permanent committee on cancer, as follows: Dr. Edward Reynolds, chairman, Dr. J. Collins Warren, Dr. R. B. Greenough, Dr. J. T. Bottomley, Dr. Edward P. Richardson.

The committee submitted a definite program of activities for the cancer education of practitioners in Massachusetts, which was adopted by the approval of the following recommendations:

> 1. That each of the district medical societies should, for the immediate future, devote one of its meetings each year to the subject of the control of cancer, the cancer committee of the state society offering to furnish speakers for such meetings if so desired.
>
> 2. That the cancer committee be authorized to distribute to the profession in Massachusetts, at the expense of the state medical society, but under the direction of its committee on membership and finance, such educational literature as it may deem wise.
>
> 3. That the cancer committee be directed to use all proper efforts toward securing state-wide opportunities for the free laboratory diagnosis of pathological tissue, as is already being done, with excellent results, in some other states.
>
> 4. That the cancer committee urge upon the Boston Medical and Surgical Journal the expediency of constant publication of such a brief outline of modern principles in the diagnosis and treatment of cancer as may meet its approval.

INTENSIVE DIAGNOSTIC METHODS.

The older diagnosticians were much admired for their ability to make such rapid and such accurate diagnoses by inspection, possibly even from the feel of the pulse—as is said of the Chinese physicians—or even from a narration of symptoms by the patient himself or by some other person for him—as is done by the modern correspondence quack. And while inspection or other superficial observations are important aids in diagnosis, their importance varies with the powers of observation of the examiner. In the early days of medicine the list of recognized diseases were few and the number of refinements in diagnosis were still fewer. But in the development of scientific medicine, of preventive medicine, the lay realization of the factor of good health and physical development in general and individual efficiency has created a place for more refinements in diagnosis. The demand by the public for diagnosis before the onset of grave symptoms has been much fostered by the Life Extension Institutes. Their endeavors are being carried to all classes and to all walks of life. They are undoubtedly playing a great part in the prolongation of life. The disease conditions they have been able to find before the presence of any subjective symptoms have done much to discredit apparently superficial and non-scientific methods of diagnosis. To the old diagnostician came only those with terminal symptoms. At present intelligent society fills the physician's consulting room during the incipient or latent stages of disease. Society now demands all the scientific aids to diagnosis and will not be prone to accept the naked opinion of the physician. The physician's brains and hands are no longer his only tools in trade. It is quite certain that in early but yet diagnosable stages of disease there are few if any outward manifestations, and not very often even in well-developed conditions. When there are such manifestations they are the result of the invasion of all the tissues of the body during disorganization or degeneration, the result of grave organic disturbances. Under these circumstances, however, diagnosis cannot help toward cure. Usually, cure is nearly all diagnosis.

No diagnosis is now made without the aid of all clinical and laboratory helps at the command of the clinician. The more ability and skill, the less likely is there to be a diagnosis without these aids. Often, it is true, these clinical aids are only confirmatory of the physician's diagnostic sense, so to say, but yet without them there would be conviction without adequate proof.

As an example of the relative inefficiency of diagnosis from superficial observations—and no matter how keenly developed they are—is cited the inspection of immigrants. Necessarily, when immense numbers must be sifted through, inspection is the only workable plan. Under this method the certification even of 2.39% is remarkably large. When, during a drop in immigration, intensive examination of immigrants was carried out, the percentage of certifications rose to 9.37 (Annual Report, Public Health Service, 1915.) The diagnostician must be a keen observer, of course; but more than that, he must be one who knows what aids to call. He must be one who knows how to marshal all the facts thus obtained and to make therefrom the proper interpretation. And yet with all the newer aids diagnosis is still an uncertain quantity and very much a problem. In an investigation of statistics in some public hospitals in New York it was found that about less than half of the diagnoses made after long observation by the most competent of men were confirmed by autopsy. It is no arraignment of the profession but rather another evidence of the infancy of the profession and the profundity of the medical sciences.

THE VERGE OF WAR.

Since the official severance of diplomatic relations between the United States and Germany, on Feb. 3, a succession of international events has slowly, but steadily and almost inevitably widened the breach between these two countries. The final commission of the long-awaited overt act on the high seas was followed by the arming of American merchant and passenger ships; and this status of armed neutrality has been converted by a series of other events into a virtual though not yet declared state of war. There still remain persons of unquestioned patriotism who continue to hope and desire that the involvement of the United States in actual hostilities and bloodshed may yet be honorably avoided, but to the majority it appears as though the entrance of this country into war were now unavoidable. The Sixty-fifth Congress, which assembled upon the President's summons in special session on April 2, has the fate of the nation and the future of the world's history in its hands.

In recent numbers of the Journal and in other columns of this issue have been noted the steps already taken in national and local preparation for impending events. In Massachusetts a part of the National Guard has already been mobilized for the protection of public works, and recruiting is in active progress for the military and naval forces of both the militia and the regulars. From the medical standpoint conditions of preparation may be regarded as already well advanced. Base hospitals have been organized, their staffs are in readiness and supplies prepared and in storage. Courses for the training of physicians in military medicine are in progress. The Massachusetts, Boston Metropolitan and other local branches of the American Red Cross have initiated a notable increase of activity in the making of supplies and in the training of civilians in first aid, home nursing, camp cooking and other branches of serviceable knowledge. The attention of members of the medical profession is particularly directed to the Journal's column of war notes in which will appear weekly comment on details connected with the progress of preparation. It is our belief, not only that the American people with its intelligent alertness has effectively profited by the lessons both of preparation and of inefficiency demonstrated by European countries, but also that the medical profession of the United States will prove itself worthy not only in loyalty but in organization, capacity and skill, to undertake and successfully discharge the duties which will devolve upon it in the event of the entrance of the United States into war.

REGISTRATION OF PHYSICIANS.

Section 3 of Chapter 55 of the Acts of 1917 provides that "no person shall enter upon or continue in the practice of medicine within this Commonwealth until he shall have presented his certificate of registration, as a physician in this Commonwealth, to the city or town clerk of the city or town where he has or intends to have an office or his usual place of business and shall . . . pay a fee of twenty-five cents. And in a like manner any physician residing in another —state and legally qualified to practise therein, whose general practice extends into the border cities or towns of this Commonwealth, and who is exempt from registration in this Commonwealth, under the provisions of section nine of chapter seventy-six of the Revised Laws, shall present his certificate of registration from the state in which he is registered to the city or town clerk of the border cities or towns in this Commonwealth to which his practice extends."

The law also provides that record by the city or town clerks shall be made upon blanks approved by the Board of Registration in Medicine, and a duplicate carbon copy shall be forwarded to the Board of Registration in Medicine.

For the benefit of the city and town clerks it may be stated that the Library Bureau, 43 Federal Street, Boston, is preparing blanks approved by the Board of Registration in Medicine which will be sold to city or town clerks, bound in groups of five, ten, twenty and fifty duplicate blanks.

These blanks will be on sale within a few days.

The law goes into effect April 10th.

Walter P. Bowers,
Secretary, Board of Registration in Medicine.

MEDICAL NOTES.

St. Lawrence State Hospital.—In the thirtieth annual report of the St. Lawrence State Hospital, Ogdensburg, N. Y. is an interesting note relating to the beneficial effect of the summer season on the recovery of its patients from their mental illnesses. The out-of-door life which the patients lead in the warm months of the year, the increased facilities for employment and recreation, all have a tendency to improve the mental and physical condition of the patients, and it is not surprising that improvement takes place in many who have perhaps been in a stationary condition. The records show that heretofore the largest number of recoveries in any quarter has occurred in the July-September period, between July 1 and September 30, and the smallest in the October-December period. During the year covered by the report 20 per cent. of the admissions, or 52 patients, were discharged recovered, and 37 others were sufficiently improved to justify their return to their homes and former occupations; in all 35.6 per cent. of the patients admitted were subsequently returned to their homes distinctly benefited by treatment.

Pneumonia in New York.—Early in March it was reported that pneumonia was abnormally prevalent in New York City. During the nine weeks ending on March 6 the disease caused 2377 deaths in that city, an increase of 534 over the corresponding period of 1916.

Endowment for Shanghai Hospital.—The will of the late Adelaide E. Swift of Allston, Mass., contains a bequest of $600 to endow a bed in the Margaret Williams Hospital at Shanghai, China.

After-Care of Infantile Paralysis Cases in New York City.—The New York Committee on After-Care of Infantile Paralysis Cases, organized in the early part of August, 1916, at the suggestion of Dr. Haven Emerson, Commissioner of Health, has issued a report of its work up to the present time. There were approximately 9,023 cases of poliomyelitis reported in New York during 1916. Of this number 2,308 died. By far the greater number of those living required after-care treatment. One of the first accomplishments of the organization was to standardize the treatment as far as possible. This was done by bringing about a great many meetings, consisting of physicians, nurses and the laity, which have resulted in the practical elimination of radical treatment. Through the united efforts of the committee, sufficient interest has been aroused leading to definite action on the part of the Public Health Committee of the New York Academy of Medicine in the promulgation of certain set standards for dispensaries, which will eventually be maintained by all recognized institutions interested in after-care work—such institutions to be inspected and graded under the auspices of the Associated Out-patient Clinics of the New York Academy of Medicine.

This Committee on Public Health—comprising L. Emmet Holt, M.D.; Virgil P. Gibney, M.D.; and Charles L. Dana, M.D.—defined the following standards of personnel and equipment which should properly be found in such dispensaries, and, on request of the After-Care Committee, the Associated Out-patient Clinics agreed to certify the existence or non-existence of these standards in any given dispensary.

The record of cases referred to and handled by this Committee up to March 1, 1917, is as follows:

Total number of cases referred to this committee, 7,354; cases referred to nursing agencies by this committee up to March 1, 1917, is as treatment under clinic supervision, 5,003; cases under care of private physicians, 1,073; cases discharged by clinic as needing no further treatment, 102; cases died since discharged from quarantine, 95.

WAR NOTES.

Meeting of Medical Students for National Defense.—A meeting attended by about five hundred medical students and internes of hospitals was held on Mar. 26, at the Harvard Medical School, in the interests of national defense. It was addressed by Dr. Charles W. Eliot and representatives of the army and navy medical corps and the public health service. Students from Harvard, Tufts and Boston University schools of medicine were present, and many signified their intention of enrolling themselves in the medical reserve corps or the public health service.

Red Cross in Readiness.—The first naval base hospital of the American Red Cross, stationed at Brooklyn, has received word to hold itself in readiness for active service. Its equipment, consisting of 250 beds, with surgical and medical supplies, is stored at the New York Navy Yard. In addition to the naval base hospital, there are six Red Cross army base hospitals in New York ready for Government service. Each has 500 beds, with a staff of twenty-five surgeons, fifty graduate nurses and twenty-five volunteer nurses.

Harjes-Norton American Ambulance Corps.—It is announced that Robert W. Goelet of New York has made a gift of $250,000 to the Harjes-Norton American Ambulance Corps, which will be used to organize two more sections of forty men each for operation behind the French lines.

American Units in Germany.—The American physicians' expedition, under the direction of Dr. Edward F. Nippert of Cincinnati, has returned to its base at Deutsch Eylau, where it will continue its work under the direction of the New York committee. The unit operating under the direction of the German-Austrian Aid Society of Chicago, has returned to Gradenz, in response to instructions from Chicago. It is reported that the German military authorities were very cordial in their insistence that the American units continue their work, and have given written assurance that they will be permitted to leave Germany whenever they desire. The unit at Maumburg has discontinued its work there and has donated its equipment to the municipality.

Harvard Men in the War.—The twenty-three members of the Harvard unit, who sailed from New York on February 22 for service in France, reached port safely, in due time.

The Harvard Memorial Society has compiled figures showing that 474 Harvard men have thus far taken an active part in the European war. These records include, besides men in the military, naval and aviation service, those who have engaged in the hospital and ambulance service and in relief work of all kinds. The American Ambulance shows a list of 186 men; the Harvard Surgical Unit, 95; the British Army, 58; French Army, 17; Belgian Relief, 16; miscellaneous medical work, 15; and miscellaneous work of all kinds, 46.

Preparedness at Johns Hopkins Medical School.—Johns Hopkins Medical School has organized a base hospital unit with about three hundred members and students and alumni, and is being indexed as to the manner in which each can serve in event of war.

Roosevelt Hospital Red Cross Unit.—The Roosevelt Hospital has organized a Red Cross base hospital unit of 500 beds. The unit is the gift of Clarence H. Mackay and his mother, Mrs. John W. Mackay, and will be prepared for service whenever called upon and wherever sent. Dr. Charles H. Peck will be the director of the unit, with Dr. James I. Russell as chief of the surgical service, and Dr. Rolfe Floyd chief of the medical service.

The Carrel-Dakin Treatment.—It is reported that the Rockefeller Institute for Medical Research has appropriated $200,000 for the establishment of a hospital to be used for the instruction of surgeons in the Carrel-Dakin treatment of the wounded. It is expected that Dr. Alexis Carrel will be granted a leave of absence from France to come here and assume personal supervision of the work. One hundred beds will be provided. The hospital will be organized as a military unit, and will also serve the purpose of testing the feasibility of the plans for a portable hospital outlined by Dr. Charles Butler, who made a study of the subject under the French war department. Successive groups of army surgeons are to be assigned to the hospital to study the treatment.

Preparation for Treatment of Tuberculous Soldiers.—The Council of Defense has requested the National Association for the Study and Prevention of Tuberculosis to make a complete survey of the facilities for caring for soldiers, prisoners or interned civilians who may contract tuberculosis, and to take such precautionary measures as may save American troops from a disastrous spread of the disease. Dr. Herman H. Biggs, New York State Commissioner of Health, who is chairman of the committee carrying on the survey, has just returned from France, where, at the request of the French government, he has made a study of the conditions in the French army which have arisen as a result of the spread of tuberculosis.

Medical Officers' Reserve Corps.—At a meeting of the Auxiliary Medical Committee for National Defense, held recently in New York, plans were made for a recruiting campaign to add 22,000 physicians to the Medical Officers' Reserve Corps. A resolution was adopted to appoint a committee of ten to study the plans in use in England and France, under which the practice of physicians who enter military or naval service is taken over in their absence by physicians who remain in civil life, and returned intact when the military and naval physicians are mustered out of service. Allowing ten surgeons for every 1000 men, a reserve corps of 25,000 men would provide for about 2,500,000 troops. The reserve corps now numbers 3000, and with the desired 22,000 recruits the desired strength would be attained.

Typhus Prevention on the Mexican Border.—To prevent the spread of typhus fever from Mexico into the United States, the Public Health Service has established six new quarantine stations in cities along the Mexican border. Stations at El Paso, Eagle Pass, Brownsville, Hidalgo and Rio Grande City are now in operation, and the plant at Lerado will be completed soon. Within the last month more than twelve thousand persons have been treated at El Paso and thousands of others have been treated at the other plants. Typhus fever has been epidemic in the plateau regions of Mexico for many years, without menace to the United State; but the disturbed political conditions in Mexico for the past five years has resulted in the constant migration of refugees, soldiers and their families, with the attendant misery and infection, so that stringent measures have become necessary in the border towns.

Mobilization of New Hampshire Physicians.—On March 26, thirty physicians from all parts of New Hampshire gathered together at Concord for an informal discussion of ways and means of military medical organization on the part of the New Hampshire profession. It was decided to appoint a committee of five physicians to represent the ten counties of the state, to organize a medical reserve corps. Another committee was appointed to investigate the advisability of the organization of a Red Cross unit, to cost about $35,000.

Gift to the American Ambulance.—A gift of $30,000 to the American ambulance field service has been announced. The gift is a memorial to the late Dr. Charles Goddard Weld of Boston, made by his mother, widow and daughter. It will be sufficient to provide twenty-two ambulances, repair cars, field kitchens, tents, etc., and will comprise an entire section of the service. Funds are being raised for the purchase of another Boston section of ambulances, which will be sent to France as soon as completed.

Auxiliary Medical Committee of Boston. A committee to perfect an organization for an effective mobilization of the medical resources of the state, to aid in obtaining officers for the regular army and naval medical corps, and to arrange suitable instruction in medical military preparedness, has been formed and is called the Auxiliary Medical Committee for National Defense.

Dr. R. P. Strong, professor of tropical medicine in the Harvard Medical School, has been chosen as permanent chairman of the committee, and Dr. John Warren as temporary secretary.

Among those on the committee are the following: Dr. E. H. Bradford, dean of Harvard Medical School; Dr. C. F. Painter, dean of Tufts Medical School; Prof. R. P. Strong, director of the School of Tropical Medicine of Harvard Medical School; Dr. E. H. Smith, dean of the Harvard Dental School; Dr. A. S. Begg, dean of the Harvard Graduate School of Medicine; Medical Director Leach, commanding officer of the Naval Hospital at Chelsea; Surgeon Leys, medical officer of the Boston Navy Yard; Col. Williams, surgeon-general, National Guard of Massachusetts; Dr. W. L. Burrage, secretary Massachusetts Medical Society; Dr. F. A. Washburn, superintendent Massachusetts General Hospital; Dr. John J. Dowling, superintendent Boston City Hospital; Prof. Harvey Cushing, chief surgeon, Peter Bent Brigham Hospital; Dr. C. A. Porter, Dr. F. B. Lund, Dr. Paul Thorndike, Dr. J. E. Goldthwait, Dr. J. B. Blake, Dr. R. B. Greenough, Dr. W. B. Cannon, Dr. Reid Hunt, Dr. R. I. Lee, Dr. Elisha Flagg, Dr. Lincoln Davis, Dr. John Warren.

Boston Chapter, American Red Cross.—The preparedness fund of $50,000, which the Boston Metropolitan Chapter of the American Red Cross is attempting to raise, has reached $18,581.

Health in the German Army.—A German press notice gives the following account of the health of the troops in the German army during the second year of the war. It states that there is an improvement in the incidence of sickness, the rate for the first year of the war being 120 per thousand for a month, and the rate for the second year being 100 per thousand for a month. Typhus has decreased from 5.6% to 1.4%, diarrhea from 2.8 to 1.8, Asiatic cholera from .32 to .24, scarlet fever from .18 to .15, tuberculosis from 2.9 to 1.7, and nervous diseases from 24.3 to 21.5. Spotted fever, intermittent fever and diphtheria have increased, the first from .03 to .08, intermittent fever from .17 to .80, and diphtheria from .24 to .57. This incidence is also true of the civil population, and the diseases in their prevalence act in the nature of epidemics which have not yet run their courses. The germs of the infections are believed to have been brought from the South by the troops. Turning to the wounded, the report states that 70% return at once to the front, 6.4% are declared unfit for service, and the rest remain on garrison and other camp duties. Of the number of wounded sent to the military base hospitals, 90% are rendered fit for service, either in the fighting lines or in the garrisons and camps, 1% die, while the rest, 9%, are mustered out of service. Since the beginning of the war a total number of 1250 have become blind.

A report through Berne via Paris states that smallpox is epidemic in Berlin, 135 cases, with 11 deaths, having been reported there and other cases in cities in the north of Germany. The authorities of Munich announce but four cases in that city. Soldiers returning from the eastern front are supposed to have brought the disease.

Typhus Epidemic in Belgium.—It is reported through Amsterdam that a typhus epidemic has broken out in Belgium. In the Province of Limburg, 80 deaths have occurred in a population of 4,000.

War Relief Funds.—On April 1 the totals of the principal New England relief funds for the European War reached the following amounts:

Belgian Fund	$547,346.57
French Wounded Fund	210,579.71
Armenian Fund	166,263.61
Serbian Distress Fund	115,098.11
Permanent Blind Fund	105,560.10
French Orphanage Fund	89,956.55
Serbian Refugee Fund	79,177.00
Polish Fund	65,553.83
Boston Ambulance Fund	56,872.71
La Fayette Fund	25,332.03
French Phthisis Fund	13,492.04
Friends' Fund	10,321.77

BOSTON AND MASSACHUSETTS.

Week's Death Rate in Boston.—During the week ending March 24, 1917, the number of deaths reported was 265 against 234 for the same period last year, with a rate of 18.36 against 16.05 last year. There were 33 deaths under one year of age, against 34 last year, and 100 deaths over 60 years of age against 77 last year.

The number of cases of principal reportable diseases were: diphtheria, 72; scarlet fever, 45; measles, 177; whooping cough, 4; typhoid fever, 3; tuberculosis, 70.

Included in the above were the following cases of non-residents: diphtheria, 7; scarlet fever, 5; measles, 6; tuberculosis, 8.

Total deaths from these diseases were:

Diphtheria, 4; scarlet fever, 5; typhoid fever, 1; tuberculosis, 26.

Included in the above were the following deaths of non-residents: diphtheria, 1; scarlet fever, 1; tuberculosis, 2.

Hospital Bequests.—By the will of the late Rev. James Keegan of Woburn the Carney Hospital is the recipient of a bequest of $1000.

By the will of the late Ellis Hollingsworth of Braintree, the Massachusetts General Hospital is to receive, upon the death of two beneficiaries, the sum of $10,000.

Massachusetts Anti-Tuberculosis League.—The third annual meeting and conference of the Massachusetts Anti-Tuberculosis League will be held on April 10, 1917, at 3 Joy Street, Boston. At the morning session the following papers will be read: "Tuberculosis in Dairy Cattle" by Curtis N. Hilliard of Simmons College; "The Danger to Children from Tuberculosis in Cattle" by Richard M. Smith, M.D., Boston; "The Importance of Proper Physical Development in Combating Tuberculosis" (illustrated) by Joel E. Goldthwait, M.D., Boston; and "Starting Health Habits in Childhood" by Miss Louisa P. Loring. At the afternoon session Dr. Donald B. Armstrong will speak on "Community Health and Tuberculosis Demonstration—Framingham; Dr. Eugene R. Kelley of the State Department of Health on "County Tuberculosis Hospitals—A Report of Progress;" Rev. Wm. B. Geoghegan of New Bedford and Dr. Arthur K. Stone of Boston, on "How Can Tuberculosis Hospitals be Made More Attractive?" and "What Becomes of the Discharged Consumptive?" by Miss Bernine W. Billings.

Monson State Hospital.—The trustees of the Monson State Hospital, Palmer, Mass., issue the annual report of that institution for the year ended November 30, 1916. The average number of patients cared for during the year past has been 1,003.37. A consulting staff has been appointed consisting of the following: consulting neurologist Dr. W. E. Paul; consulting physician, Dr. H. L. Smith; alternate consulting physician; Dr. M. I. Shea; consulting surgeon, Dr. W. R. Weiser, alternate consulting surgeon, Dr. J. M. Birnie; consulting physician on diseases of the skin, Dr. D. E. Harriman; Dr. A. H. Galvin, consulting orthopedic surgeon; Dr. G. A. Moore, consulting oculist and aurist. The photographing of the brain sections has been carried on this year as formerly. The full report of this work is in the hands of the state pathologist and a publication based upon the work done with this material is anticipated.

Forsyth Dental Infirmary for Children.—The recently published second annual report of the Forsyth Dental Infirmary states that during the year 1916 a total of 29,186 cases were treated. It is the effort of the Infirmary to induce parents and school nurses to send the children to be treated at as early an age as possible, for the Infirmary had been in operation but a few months when it was evident that in spite of the large number of operations performed, the actual difficulty was not being remedied, that the cases did not reach the Infirmary until after the destruction of the six-year molars. This led to the plan of eliminating the older cases and making room for the younger ones of six or seven years of age. This plan at the present time is but partial, as the older children are admitted for simple fillings, but the effort is being made to induce children from two to five years of age to come to the clinic for routine treatment.

NEW ENGLAND NOTES.

CONNECTICUT.—At the annual meeting of the Hospital Association of New London, the management committee reported that the institution was better and more thoroughly equipped than at any previous time.

The small-pox situation in Waterbury has brought discussion on the advisability of establishing an isolation hospital for such cases. The Chamber of Commerce has voted that a building for such purpose be purchased as soon as possible. It was noted that since the disease broke out last summer there have been 250 cases but none of them fatal. Of the total number that were stricken with the disease not over a dozen had ever been vaccinated.

At a meeting of the Norwich Medical Society on March 19, Dr. James J. Donohue made an address on the Compensation Act.

A fund of $40,000, which was originally offered for the care of aged persons in Torrington, will be given to the Charlotte Hungerford Corporation for the care of patients suffering with tuberculosis.

NEW HAMPSHIRE.—Measles, which was suppressed last month after a run in the St. Francis Xavier Parochial School, Nashua, broke out this week in epidemic form at the O'Donnell School, the nearest public school to that institution. Over 60 cases were reported on March 18. Out of 200 cases in the city, only two have been fatal.

Whooping cough is prevalent at North Salem and Canobie Lake.

Physicians from all parts of New Hampshire met March 27 to discuss plans for medical preparedness. Dr. D. E. Sullivan, president of the State Medical Association, presided. The organization of a district physicians' unit of the Red Cross, at an estimated cost of $35,000, was discussed and a committee appointed to investigate the advisability of this action.

Harvard Medical School.

REPORT OF DEAN, HARVARD MEDICAL SCHOOL.—The recently published report of the Dean of Harvard Medical School deserves special notice as it illustrates the aid which can be given by a medical school well equipped with laboratories and hospital clinics in the investigation of questions involving public welfare and health. During the year 1915-16, Professor Wolbach of the Department of Bacteriology, was requested by the State Board of Health of Montana to examine the nature of a prevalent disease called Rocky Mountain fever. Professor Wolbach has succeeded in demonstrating the cause and nature of the affection in a manner which will lead to the future control of this disease. Professor Mallory, requested by the Mayor of Boston, offered the facilities of the laboratory of the City Hospital to conduct an investigation into the causation of scarlet fever, has already facts and suggestions of importance. The extensive epidemic of poliomyelitis led to the organization of a commission to work in conjunction with the State and City Boards of Health, and the results obtained have already justified its establishment. It has also been a significant demonstration of what can be accomplished in the way of public health work cooperation by the Department of Preventive Medicine and the value of such coöperative work to the students of the school for health officers.

The whole subject of food assimilation and food values has been zealously considered not only in the Departments of Biological Chemistry and Physiology, but also in the clinics and laboratories of the Peter Bent Brigham, Psychopathic, Children's, Infants' and Massachusetts General Hospitals. Investigations of great importance on nephritis and its complicating disturbances in the heart have been made during the past year by Dr. Christian and his colleagues and associates.

In compliance with the request to the School made by the Surgeon-General of the United States and of the Military Branch of the American Red Cross, hospital units have been organized by the Staffs of the Peter Bent Brigham and Massachusetts General and Boston City Hospitals. Money has been raised for the equipment of units, to be held in readiness in case of the need of medical military service. During the past year an ambulance corps was organized among the students and officers of the School who were drilled systematically in connection with the Harvard Regiment. The Harvard Medical Unit, serving at the request of the British Army Medical Department in the surgical charge of Hospital 22 of the British forces in France, has continued in the work undertaken two years ago. It is planned to continue the work with the help of volunteers among Harvard medical graduates. The surgical service is under the continuous direction of a representative of the Surgical Department of the Harvard Medical School.

Correspondence.

COMMITTEE ON ACCURACY OF CERTIFIED CAUSES OF DEATH.

Mr. Editor:— New York, March 19, 1917.

The United States Public Health Service has recently issued a reprint of the conclusions of a Committee of the Section on Vital Statistics of the American Public Health Association, which the Public Health Service published in its weekly report of Sept. 22, 1916. These conclusions were presented to the Section on Vital Statistics at Cincinnati last October, and in view of the great importance of the subject, the Section voted to continue the Committee and ask it to make a second report at the 1917 meeting, after submitting the first one to those best qualified to offer constructive, critical, and specific comments on its findings. A list of these contains your name, and you are urgently requested to give the subject all possible consideration.

In reporting its conclusions title by title, the Committee has used the terms "acceptable" and "not acceptable" to indicate its opinion for or against the unqualified acceptance of certificates of death under each title as reliable data upon which to base honest mortality statistics. When the conclusion is stated that a certain title is "unacceptable without autopsy" or without certain clinical or laboratory confirmation, the inference is not to be drawn that the committee wishes to eliminate the title; it merely wishes to suggest that the unsupported statement of death from this cause is unworthy of inclusion in reliable mortality statistics, but that such cause is a proper statement of death and may be included in credible statistics if certain specified data accompany the report of death.

It is desired to emphasize the statement that the changes recommended by the Committee, if adopted by the Section, will in no way affect the annual mortality reports of the Bureau of the Census to be published for the years prior to the next revision of the International List of Causes of Death, effective for the decennium beginning with 1920. It will affect them then only to the extent that the International Commission, charged with the revision of the International List, may rule, should it vote to approve recommendation for changing certain titles or sub-titles.

The Committee believes that the annual census statistics of causes of death, the quality of which has so greatly improved in recent years, should be supplemented (not supplanted) by the publication of tables showing the number of deaths *surely* assignable to each cause. Such tables will, necessarily, relate only to deaths in which there is no reasonable doubt that the fatal termination was caused by the condition reported. It has, therefore, considered each title-heading of the International List, and its conclusions, as published in Reprint No. 363, set forth its opinion as to.

1. What titles or headings of the list should be considered *in se* as "acceptable" statements of cause of death: these headings relate to conditions the diagnosis of which, in the opinion of the Committee, is reasonably certain, and confirmation of which, by laboratory findings or autopsy, is unnecessary.
2. What titles or headings should be considered "not acceptable" statements of cause of death, unless accompanied by specific supporting data, such as laboratory confirmation or autopsy. Returns of deaths reported as caused by conditions listed under titles which the Committee has classed as "not acceptable" should not be used in preparing tables showing the numbers of deaths *surely* assignable to that title, unless confirmed by specific supporting data.
3. What sub-headings or "terms" at present listed under the main titles are definite terms and true and adequate statements of the condition to which the title-heading relates; what ones are obsolete or insufficient, according to present-day standards.
4. Recommendations covering changes in names of titles, transfers of sub-headings or included terms from one title to another, and "elimination" of some of these sub-headings. The word "eliminate," as used in this connection during the deliberations of the Committee, registers its opinion of certain terms as inadequate, unscientific, obsolete, or unsuitable for one reason or another. The Committee advises against their use, but recognizes that many of them will be used by physicians for many years to come, and that when no additional data are obtainable, they must be classified for general mortality statistics under the title-headings which represent most probably what the physician intended when he used them.

It is believed that all members of the Section on Vital Statistics and others who will be good enough to take time to study the inclusions here presented, in the light of the foregoing remarks, will find that an important advance towards the accuracy of the fundamental data upon which public health administration must be based, is herewith proposed.

Very truly yours,

H. Emerson, M.D., *Chairman.*

AN ANECDOTE OF MEAD AND RADCLIFFE.

Boston, March 26, 1917.

Mr. Editor:—

Of all the famous English physicians of olden times Dr. Radcliffe was probably the most eccentric. Mead, his junior by many years, was just becoming known in London when the following incident occurred, which is related in "Physic and Physicians, A Medical Sketch Book," published in 1845.

"The pleasures of the table had great charms for Radcliffe, and Dr. Lettson has reported a curious relation on this subject as told him by the eccentric Dr. Mounsey."

"A little behind my house," says Dr. Cumming, "lies Carshalton, at which place, in days of yore, I have been informed that Dr. Radcliffe and the great Dons of his day held an hebdomadal meeting, sacred, not to Aesculapius, but to Bacchus.

To admit a young physician to these meetings was deemed a distinguised honor, for no one was asked unless he seemed likely to prove conspicuous. When Dr. Mead was young and just beginning to be talked of he was asked to Carshalton."

The meetings, we are told, proved most convivial, and finally Mead and Radcliffe were the only ones left. Radcliffe, feeling at peace with all the world, turned to Mead, saying, "Mead, will you succeed men?" "It is impossible," replied the polite Mead. "You are Alexander the Great, and no man can succeed Radcliffe. To succeed to one of his kingdoms, is the utmost of my ambitions." Radcliffe, susceptible to this flattery, replied, "I will recommend you to my patients." Radcliffe called on Mead the next day, and finding him deep in the study of Hippocrates, exclaimed, "Do you read Hippocrates in the original Greek?" "Yes," respectfully answered Mead.

"I never read it in my life," said the great Radcliffe. "No," replied Mead, "you have no occasion, you are Hippocrates himself." This did the business for Mead, and it completely gained the great Radcliffe, and when he did not choose to attend patients he recommended Mead, who from that moment rapidly rose in his profession.

Yours truly,

Wm. Pearce Coues, M.D.

SOCIETY NOTICES.

Massachusetts Society of Examining Physicians.—The annual meeting of the Massachusetts Society of Examining Physicians will be held April 4, 1917, at the Copley-Plaza hotel. Dinner at 6.30 p.m., meeting at 8 p.m.

1. Pitfalls into which Insurance Examiners are apt to fall.
   John S. Phelps, M.D.
   Medical Director Columbian Ins. Co.
2. Failing cardiac compensation.
   Charles H. Lawrence, M.D.
   Brigham Hospital.
3. Following up cases of failing cardiac compensation.
   Miss Ida Cannon,
   Chief of Social Service, Mass. Gen. Hospital.

Discussion opened by Dr. William H. Robey, Jr., and Dr. Frederick T. Lord.

Election of officers, etc.

James H. Stevens, M.D., *Secretary.*

NORFOLK SOUTH DISTRICT MEDICAL SOCIETY.—Meeting for Medical Improvement at United States Hotel, Boston, Thursday, April 5, 1917, at 11.30 a. m.

Reader, George L. Tobey, Jr., M.D., of Boston, for Arthur J. Cole, M.D., of Holbrook.

Subject: "Acute Mastoiditis; Diagnosis and Treatment."

F. H. MERRIAM, M.D., *Secretary*,
South Braintree, Mass.

BOSTON CITY HOSPITAL ALUMNI ASSOCIATION.—The twenty-eighth annual meeting of the Boston City Hospital Alumni Association will be held at the Copley-Plaza Hotel on Wednesday, April 11, 1917, at 6.30 o'clock. Dinner will be served at 7 o'clock sharp, immediately after the business meeting. Dr. Elliott G. Brackett will preside. Communications from guests and members will be presented at the close of the dinner.

The price of the dinner will be two dollars for graduates of five years' standing or less, and three dollars for others. Small tables will be provided for members who desire to organize parties of eight, but notice must be given to the secretary at least one day in advance.

The Alumni are cordially invited to watch the operations at the Boston City Hospital, which will be performed in the morning, or to make ward visits with the different medical services. Also, beginning at 10.30 o'clock, the following papers will be offered by members of the staff in the Surgical Amphitheatre:—

"Types of Tubo-Ovarian Suppuration and Their Treatment." Dr. Robert M. Green.

"Infarction of the Lung." Dr. William H. Robey, Jr.

"Labyrinthine Tests in Space Sense Derangement." Dr. Edgar M. Holmes.

"Intra-ventricular Injections of Salvarsanized Serum in Case of Syphilis of the Central Nervous System." Dr. Edward H. Nichols.

"Report of a Case of Dermatitis Congelationis of the Third Degree Resulting from the Application of an Ice-bag." Dr. Townsend W. Thorndike.

"Nerve Regeneration after Suture." Dr. Isador H. Coriat.

The Trustees have invited the Alumni to luncheon in the Hospital Library at one o'clock. The entire hospital will be open for inspection all day.

It is hoped that every graduate will make an earnest effort to be present both at the Hospital exercises and the dinner in the evening.

CADIS PHIPPS, M.D., *Secretary*.

THE MASSACHUSETTS THERAPEUTIC MASSAGE ASSOCIATION.—The next meeting will be held at the Massachusetts General Hospital on Tuesday, April 10, at 8 P.M.

Dr. Paul D. White will tell about RECENT DEVELOPMENTS IN THE STUDY OF DISEASES OF THE HEART.

Please be prompt and thus show your appreciation.

DOUGLAS GRAHAM, M.D., *President*.
MRS. MABEL F. WALKER, *Secretary*.

THE HARVEY SOCIETY.—The ninth lecture of the series will be given at the New York Academy of Medicine, 17 West Forty-Third Street, on Saturday evening, April 7, 1917, at 8.30 P.M., by Prof. W. H. Howell, Johns Hopkins University Subject: "The Coagulation of the Blood."

MARRIAGES.

DR. CARL J. HART, of New Britain, Conn., was married on March 24 to Miss Emma Johnston, a graduate of the New Britain Training School for Nurses.

APPOINTMENT.

DR. PHILIP W. PLACE, of Boston, has been appointed resident physician at the *Contagious Department of the Cincinnati City Hospital*.

RECENT DEATHS.

DR. JOSEPH FRANCIS O'SHEA, City Physician of Lynn, died in that city, March 29, at the age of 54. He was a native of Ireland, coming to America when a boy, and getting his medical training in the University of the City of New York. He was graduated in 1886, and settled in Lynn, joining the Massachusetts Medical Society in that year. He was Assistant Medical Examiner and a memer of the staff of the Lynn Hospital. His widow survives him.

DR. THOMAS BERNARD SHEA died at his home in Boston, March 25, of heart failure. He was 54 years old, a graduate of the Roxbury Latin School, of Holy Cross College and of Harvard Medical School in the class of 1887. Dr. Shea was quarantine officer at the Port of Boston 1888-1890, Medical Inspector of the Board of Health, 1890-1904 and Deputy Commissioner of Health in charge of the sanitary division from that time until his death. He was a Fellow of the Massachusetts Medical Society.

DR. SAMUEL J. BASSFORD, who died March 16, at the St. Barnabas Hospital, Portland, Me., after an operation, was born in Thomaston, Conn. He was graduated from Bowdoin Medical School in 1881. He practised medicine in Biddeford and Portland. He was prominent in the Cumberland Medical Association and also in the Practitioners' Club. He is survived by a daughter.

DR. DANIEL GOODENOW, who died on Wednesday, March 14, on the way from Florida to New York, was born in Lewiston, Me., Dec. 15, 1863. He was graduated from Dartmouth College in 1885, and from Dartmouth Medical School in 1889. He resided for about 20 years in Maynard, Mass., where he practised his profession. He is survived by his wife, one daughter, two sisters and two brothers.

DR. HALL STAPLES, who died March 7 at his home in West Acton, was born in Windham, Me., Dec. 3, 1870. He was educated in the public schools at Windham, was graduated from Brighton Academy in 1887 and spent one year at Bowdoin College. He was graduated from Dartmouth Medical School in 1892, and further pursued his studies at the New York Post Graduate Hospital. He was town physician in Acton for a number of years. He practised medicine in Grafton, Vt., Shirley and Waltham, going to Acton about nine years ago. Dr. Staples was a member of the Dartmouth Alumni Association, and Vermont and Massachusetts State Medical Societies. He is survived by his wife and a daughter, his mother and stepfather.

DR. ALVAH A. WARREN, who died March 19 at his home in Central Falls, R. I., was born in that city 43 years ago. He was a graduate of the School of Pharmacy in Providence, and also of the Baltimore University Medical School. He was a member of the Rhode Island Medical Association. His widow, two sons, four brothers and a sister survive him.

DR. HERSCHEL N. WAITE, who died March 9, at his home in Johnson, Vt., from Bright's disease, was born in Stowe, Feb. 13, 1850. He was graduated in 1882 from the Eclectic Medical College in New York City. In 1882 he established in New York the Yorkville and Harlem Free Dispensary for the poorer classes and for clinical instruction for eclectic physicians. In 1885 he received the honorary degree of Doctor of Medicine from the Eclectic Medical College of Cincinnati, and later became the executive member of the University of Medicine and the American Medical College of Indianapolis, Ind., for the State of Vermont. At Montpelier, in 1895, he organized the New England Eclectic Medical Association. He is survived by one daughter and two sisters.